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| Wise, Col. | ... | ... | ... | ... | ...Poona |
| Wise, H. S. | ... | ... | ... | ... | ...Bombay |
| Woodward, W. | ... | ... | ... | ... | ...Bombay |
| Wroughton, R. C. | ... | ... | ... | ... | ...Tanna |
| Wylie, R. | ... | ... | ... | ... | ...Gadechi |
| | | | | | |
| Yeld, Dr. H.... | ... | ... | ... | ... | ...Bombay |
| Yerbury, Major | ... | ... | ... | ... | ...Punjab |
| Young, G. S. | ... | ... | ... | ... | ...Bombay |
| Young, W. E. | ... | ... | ... | ... | ...Bombay |

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WATERS OF WESTERN INDIA.

PART III.—THE KONKAN AND COAST.

(By a Member of the Society.)

THE remaining Reptiles of the Region are all Batrachians. The Frogs are much the same as in the few damp parts of the Deccan, but more numerous. The Cœcilians, or blind-worms, are rather rare; and I do not think that there are any newts. Singularly enough, the name “niwta” is applied to certain leaping-fishes, which will be dealt with in their own place; and which, seen at a little distance in their native mud, have very much the appearance and action of reptiles.

The fishes, naturally, are numerous and important, and I shall take them in order; following usually the classification of Dr. Day, unquestionably the standard authority on Indian fishes.

The family of Perches is only represented in the fresh waters by few and small (though often prettily marked) species, chiefly of *Ambassis*. The so-called climbing Perch (*Anabas scanlens*), belongs to another family, although decidedly perch-like in appearance; I have not procured it in the Konkan myself.

The marine Perches, however, are very numerous and important here, as throughout the tropical and sub-tropical seas, in which,

to a great extent, they assume the place (and very often the name) of the northern Cod family, here represented only by a few small species. Where you find "rock-cod," "cod-sounds," or "cod-roes" in tropical trade, the term generally refers to one of these perches, or to some related spiny-finned fish.

They do not seem to affect the depths of the ocean, but haunt banks or reefs, from the shore to about 200 fathoms, feeding, as a rule, not very far from the bottom.

The commonest here are small rock-perches, called on Bombay tables "stone-fish," of which the best, perhaps, is the "Cock-up fish," *Lates calcarifer*. This is a fish chiefly of the estuaries, and, where permitted, it comes some way above highwater mark, and lives for some time in fresh water. An allied species, the "Kargota," or "belt-fish" (*Therapon Jarbua*), is often kept in wells by the natives, and seems to thrive there as well as in the sea. It is a handsome little fish, with deep brown bands on a whitish ground, which in sunlit water look black and gold.

The natives call most of these rock-perches "Gobra," or "Gobri," from the dull olive colours of one or two taken by them as types, which they compare to the colour of cowdung (gobar or govar).

Most of the commonest belong to the genera *Serranus* and *Lutianus*, and a few, such as *Serranus Malabaricus*, attain a very large size; but these are not often seen on European tables. *Serranus Bænaek* ("Bhui-nak" = "chief-fisherman,") is prettily marked with sky blue, and some others have brilliant colours, but these are not very common in the waters of the coast, usually more or less dull with mud.* The *Lutiani* are more commonly bright coloured than the *Serrani*; and, in my experience, keep further off shore. One of them (*Lutianus Argentimaculatus*, I think,) is mentioned and figured by Mr. Thomas as a fish giving sport with the rod in his region. It is a very fine fish, of a deep cherry colour when mature, and grows to at least 15 lbs. weight. A very closely allied species, *L. roseus*, is the "red rock-cod," of the Straits Settlement. All these perches are very fair eating when fresh. I shall take here, somewhat out of turn, the *Sciænas*, called by the natives "Gul" or "rose" fish, I suppose from a faint pink blush which they have on death. Some Europeans in Bombay call them "buffalo-fish," which I have noted above as a Deccan name for the Mahseer.

* Some *Serrani* are said to present the curious phenomena of perfect milt and not normally developed in the same fish.

Similarly the red sea perches are called on the coast "*Tambe*," or "copper fish," which above ghât is the name of the Roho.

The "Red Sea Salmon" of steamer's cooks is a *Sciæna*, and so is the "Canal Mullet," sometimes caught when ships pass a night in the Suez Canal. The *Sciænas* generally are but coarse fish, compared to those mentioned above; but they grow to 5 and 6 feet long. They, and many of the larger sea perches, yield isinglass, which goes abroad under the name of "cod-sounds."

The next family, the *Squamipinnes*, is much less important in number and size, either of species or individuals. Several of its members, however, are remarkable for their strange forms, bright colours, or handsome markings, as the long-snouted *Choetodons*, and the "Warra" (*Scatophagus Argus*) "spotted like the pard." Most of these fishes have somewhat the shape of a pomflet, that is, they are "flat-fish" *on a dish*; but *deep* fish in the water. They are, however, squarer about the shoulder, breast, and flanks than, the pomflets, and much inferior in size and in flavour.

The next family is that of the *Mullidæ*; or Red Mulletts, which should be distinguished from the grey mullets. There are no true red mullets, I am sorry to say, on our coast; so my chapter on them is like that on snakes in Iceland.

They are represented here by some poor relations of the genera *Mulloidæ* and *Upeneus*, small and scarce, but brightly coloured. I have not myself obtained any specimens. The next two families have few important genera except *Chrysophrys*, of which one species, *C. berda*, a fine perch-like fish, is the "black rock-cod" of the Madras side; and passing over a lot of fishes of "merely academical interest," the next family worth notice is that of the *Scorpenidæ*, which are about as eccentric in shape and colour as anything in the sea. Their chief representative here is the "Kombada," or "cock-fish" (*Pterois Russellii*), a handsome fish, banded scarlet, and black, and provided with huge fins that look as if they had been "torn in a scuffle." We have specimens in our Museum; unluckily the colours are not permanent in spirits. The "Kombada" sometimes reaches 15 inches long, and is certainly the showiest fish of our coast.

The Mango-fishes (*Polynemidæ*), famous on the Bengal side of the punkah, have little reputation here. The reason is, probably, that the pick of the basket, *Polynemus paradiseus*, is "anadromous," *i.e.*, it runs up rivers to spawn; and there are in the Konkan no rivers

suitable for that purpose. If the matter were taken up at the mouth of the Tapti or Nerbudda, very likely the fish might be got in good season there. The Maratha name is "Chela" (= "disciple"), which corresponds to the Bengal "Tapasi," said to mean a hermit or penitent. The large *Polynemi* are here called "Ráwas," and are very fair eating, though not in the first class.

The next is a remarkable family, the Sword-fishes, represented here by at least one species, *Istiophorus brevirostris*, called in Maratha "Tár-mása," or "Wire-fish," probably from the filiform ventral appendages; and also (according to an unsigned MS. note in my office copy of Day) "Már-mása," or "the striker," which seems more appropriate. In this fish the upper jaw, or snout, is not so long as in the Atlantic *Xiphias*, or even in some of its own congeners; but there is quite enough of it to make a very formidable weapon, as its length from the gape appears to be about $\frac{2}{3}$ of the total length of the fish, which sometimes exceeds 10 feet. That it is used as a weapon is proved by many instances; but in particular there is in our Museum a "sword" of this species which I myself found sticking in the left hind-leg-socket of a turtle (*Cawana olivacea*), brought to me alive. Not only *malice prepense*, but considerable cunning of fence, were required to inflict this wound. Judging by proportions, the sword-fish must have been lighter than the turtle (not a large specimen), and it is not easy to see what he could expect to do with the latter when dead.

After the Sword-fishes, quaintly enough, come Scabbard-fishes (*Trichiuridæ*), long thin creatures like silver streamers, fancifully supposed to resemble a steel regulation scabbard. They are very good eating when fresh, but are chiefly used here for drying without salt in the sun, for which their shape fits them well. They live on the top of the water, sometimes in great numbers, and are much preyed up by sea-fowl. Sometimes they will jump into a boat, like the Garfishes.

The next family, *Carangidæ*, contains one very notable little fish, the "pilot-fish," who is supposed to take charge of sharks, ships, or any other large things that he considers unable to take care of themselves. I have not got any specimens here. One species of *Caranx*, very common, pretends to be a mackerel, and two or three to be pomflets, but the resemblance is external only. They are branded by the natives with the titles of "Chor-wágada" and "Chor (thief) Sarga." Accordingly the true pomflets (*Stromateus*)

come immediately after them, and require little description in Bombay. The native name for the white pomflet is "Sarga," and for the black "Halwa." The Portuguese name is "Pumpano," and a fish of this name is a delicacy in the American "Gulf States" and is brought in ice to New York, where it looks and tastes very much as a pomflet does in Poona. Whether it is a true *Stromateus* or not I cannot say. The "Pumpano" was mentioned as a good fish of this coast by Van Linschoten in the sixteenth century. It may be worth while to remark that it is not a flat-fish in the same sense as turbot and soles are, but swims upright on edge like a John Dorey, which, indeed, is also more like a pomflet in flavour than any other fish of Northern Seas.

The monsoon fishery for both pomflets, but especially the black, is conducted on the Bombay coast at considerable risk; large open "machwas" (fishing smacks) remaining out of sight of land often for two or three days. Great care is shown in fitting out these boats, and they carry double or treble crews, but their return is always awaited with anxiety, and the fish are as much "lives o' men" as any herring in the North Sea. (Query, "pomfret" or "pomflet"?) Pretty close to the pomflets, though more nearly allied to the next family, are the so-called "Dolphins," of modern sea-folk, famous for changing colour in dying. They are oceanic fish, and not common here. I have no specimens from this coast, nor any vernacular name for them. I need hardly say that the classic Dolphin was a *porpoise*.

I have dined in Bombay, off and on, for eighteen years without ever seeing a mackerel on table there, and a great many people who find "cod" all over the world would tell you that there are no mackerel here. The fact is, however, that a mackerel closely resembling the British species is common near Bombay in the cold weather, and has very much the habits of its northern relative, especially that of playing in schools on the surface. Only, it will not here take any sort of a trailing bait or fly; nor have I ever been able to catch any sea fish near Bombay by that most sporting method. It is said to answer well enough down the coast. The Indian mackerel (*Scomber microlepidotus*) is smaller than the British fish, seldom reaching one foot long; when fresh it is a very good fish indeed, but keeps badly.

It is taken in seines all along the coast, on the flat strands, and must, I should think, often be so taken in Back Bay; and

there I should advise any one who wants a Bombay mackerel to look out for it. The Maratha name is "Wágada."

The large mackerels, or tunnies, *Thynnus*, *Pelamys*, and *Cybium*, mostly keep to deep water, and come to us under the general name of "Sur-mahi," (Persian = "Red-fish,") which we render "Seer-fish," as a very tolerable substitute for salt cod and salmon. One species, *Cybium guttatum* is said to reach 6 feet long, and they are all reported to take a trailed bait or fly well in the offing, so that they will afford sport to the generation of yachtsmen who shall learn to sail outside the harbour. The last genus of the mackerels is *Echeneis*, containing the curious sucking-fish, called on this coast "Sakála" (*E. Neucrates*), and "Luchung," (*E. albescens*). Of these, under the name of "Chazo," it has lately been written that the Zanzibar fishermen put a ring on their tail with a line in it and send them forth to attach themselves to big fish by the curious sucker on the top of the head. No one here utilizes them in this remarkable manner, though their habit of "getting a lift" from other fishes is well known. The yarn had been spun before about some South American fishermen, but with less detail and authority, and it was not then very generally believed. At present, though no European has actually seen this fishery, the evidence is good enough for a strong probability, and there is some of a similar practice in Madagascar with a fish, probably allied, called "Tarudu." The Albacores, Bonitos, and "Spanish" Mackerel of the Atlantic are all *Scombridæ* (Mackerels).

The next family, *Uranoscopidæ*, are about as unlike the graceful and beautifully coloured mackerels as anything can be. They are represented here by the "Yekru" (*Ichthyscopus inermis*), a deformed and blotchy creature, best described in Dr. Day's words, "It made a curious noise, half snapping and half croaking."

But the *Trachinidæ*, which follow, have a fine slender form, a good flavour, and a pretty name; for two or three of their genus *Sillago* are known in India as "lady fishes." I am not sure whether the name is a compliment to the shape of the fish, or to its nutritive qualities, which recommend it in native medicine, to ladies in (or just out of) "an interesting condition." It is quite as good for the most uninteresting of their worser halves; it tastes like an English smelt, and therefore, I suppose, some people call it a "whiting." The Maratha name is "Murdi" The *Sillagos* are fish of the

sand, and of shallow waters, where they are usually taken with the seine, or with small nets.

Passing over a small and uninteresting family (*Pseudochromides*) we come to the *Batrachidæ*, or toad-fishes. Ours are only remarkable for ugliness and size (reaching 3 feet long), but an American Pacific species (*Thalassophryne reticulatus*) is probably alone among fishes in possessing a blood-poisoning apparatus inferior in degree only to that of a venomous snake. The operculum or gill cover has a long tubular spine with a poison-sac at its base, containing a venom supposed to be secreted in the muciferous channels, and capable of causing fever, though apparently no more.

The attention devoted to this remarkable fish may help us hereafter with other "sting-fishes." Most practical fishermen believe in a specific poison in the wounds inflicted by various species, especially the northern "Piky Dog-fish" (*Spinax*), and some tropical Siluroids. The effects are far too severe to be due to the mere laceration of the most serrated spine, and it is probable that the mucus is more or less poisonous.

In a similar way the secretions of the skin of some otherwise harmless reptiles (especially, according to Mr. Murray, the Sind "biscobra," *Eublepharis Hardwickii*) are certainly capable of causing irritation to the epidermis, *à fortiori* more if inoculated.

An European member of one of the following families, *Cottus scorpio* of the *Cottidæ*, is much dreaded at home on this very score; inflicting injuries altogether out of proportion to the size of its little prickles. Passing over these and one or two others, we come to the Gobies, very numerous and interesting to people who know more about them already than I can write here, or perhaps anywhere. They are small, often brightly coloured, or at least well marked, and "too numerous to mention." There are however, two goggle-eyed genera, which are really among the wonders of the coast. *Periophthalmus* and *Boleophthalmus*, the leaping fishes or "mud fish" of the tidal waters. The Marathas call those which frequent muddy creeks "Niwte" and those of rocky shores "Kharba." The former may be seen, whenever the tide is out, crawling in myriads over the mud, getting in and out of each other's way in the most ludicrous fashion, and all disappearing in the mud as by magic, when alarmed. *B. Boddaerti* is our commonest here. It has bright blue spots. Those of the rocks, which are mostly *Periophthalmi*, are very provoking to any one hunting the tidal pools for specimens.

Just as the prey seems to be penned up in a corner behind the hand-net, hop-skip-and-a-jump, he is in another puddle five or six yards away, and he always does jump for that next puddle, and never out on dry rock.

The way to fix him is to have two hand-nets and lay one of them over puddle No. 2 before beating up his quarters in No. 1. I have seen one of these little fishes deliberately follow a bait, which I slowly withdrew from him, about 2 feet up a rock. Some kept in an aquarium preferred, apparently, to be out of water, or at least half-out, and would remain so for hours without moving. They are very tolerable eating, when well washed inside and out, or after keeping for a few hours in clean sea-water.

For the next family, the Blennies, I can do no better than borrow Major Beavan's statement that they "are a most ferocious lot of little fishes, they reside mostly on or near the bottom; some of the species are remarkable for producing their young alive." Ours vary very much in form; some (*Eleotris*) are eel-like, of a dirty pink colour, and very ugly; others are smart little fishes, well-finned.

After them come the "Spiny Eels," well known on all Mofussil breakfast tables as "Bhàm Machi," and generally called in English "Eels," though they are not really eels at all, in nature or flavour. For the benefit of readers who may have seen them only on the dish, I may remark that they have a queer proboscis like that of a tapir, many prickles on the back, and few on the belly. They are exclusively fresh water fish, and can be taken with a worm, a bit of raw meat or almost any other animal bait.

Several Atherines, or sand-smelts, are recorded; but I have got none of them here, which is probably my own fault—and misfortune, as the whole family are good to eat.

The Grey Mulletts, to be carefully distinguished from the Red Mulletts, abound in the creeks along the shore, and when fresh and in good condition, are as good for the table as any fish we have. They are generally known as "Bhui Mása" or "Fisherman fish" and a very good and handsome striped species (*Mugil æur*) as "Thoda." This last reaches a yard in length. I have never found a bait for them, though I have read of many.

The next two families are small and uninteresting here, except that one fish, *Fistularia Serrata*, happens to have a long central tail ray, which, being transferred to the tail of another fish by accident or design (in a collection) helped to get up a bogus "new

species," and a very pretty quarrel upon the merits. It is not common.

The "Snake-headed" Murrells are the same here as in the Deccan. These fish, indeed, vary little throughout India, as might be expected from their power of passing overland. They are exclusively freshwater fishes.

The next family, *Labyrinthici*, includes the "climbing perch," which I have not got here, but it may reasonably be looked for. Dr. Day's account of the dangers of this fish, and the remedy, is sufficiently original to be well worth transcribing. "Accidents are constantly occurring, due to native fishermen killing these fishes * * by a bite. While the fish is in the fisherman's mouth for this humane purpose (as it is covered by a slimy, slippery secretion) it occasionally slips into his throat, then owing to its spiny character, it cannot be withdrawn without extensive laceration. * * * * should the fish be still alive, cut off the projecting or caudal portion, causing it to die of hæmorrhage * * * * the decay of the animal is most rapid;" and when it is complete, the extraction of course is easy; but on the whole I had rather some one else bit my perches for me.

The spines of an allied genus (*Polyacanthus*) "inflict a most severe burning pain which lasts for two or three hours" (Jerdon). I have not got it here; but it *should* be here. Another relative is the Gourami (*Osphromenus olfax*), which I believe has been put into Vehar lake. Whether any specimens have been taken out, I have not heard. It is a Chinese and Malay fish, naturalized in different places all round the world, and said to be very good eating, which reputation, and the family character of living with little water, or little change of the same water, have been the cause and means of its travels. I think it was Sir William Denison who introduced it into Madras, where it has since been chiefly looked after by Mr. Thomas.

Passing over one small family, the next worth noticing are the *Labridæ*, or Wrasses, which are represented in British seas. They are, with few exceptions small fish, haunting weedy rocks or coral reefs, exclusively marine, and remarkable for their bright colours, which vary in the individuals of several species, and in some appear to indicate sex, *a very rare case amongst fishes*. They could not be passed over, but I have not found any here that require special notice. None are of any importance as food, and our dull inshore

waters, and barren basaltic reefs, are ill-suited to the development of their characteristic coloration.

The next family, *Chromides*, seems to be hardly represented here, if at all. One species, *Eutroplus Suratensis*, apparently received its specific name by mistake, the type specimen probably came from Tranquebar (Day). The genus is found in fresh-waters and estuaries on the Malabar Coast, and this species is said to take a bait freely, and be good eating; "but is not so easily captured in a net, as it buries itself in the mud, or dives under the net." It might be worth importing.

We have now disposed of the *Acanthopterygii*, or spiny-finned fishes, of which the Perch is at the head, and begin the *Anacanthini*, or soft-rayed fishes, whose file leader is the cod. The *Gadidae*, or Cod family, are very numerous in northern seas, including such familiar fish as the Haddock and Whiting, the coarser Hake and Ling, and the sporting Pollack and Coal-fish, well known to marine fly-fishers at home. In Day's enormous list, however, there are only two species of this family recorded as Indian fish. Both are of one genus, *Bregmaceros*. I have myself obtained on this coast a single specimen of *B. Atripinnis*. Neither species gets beyond the size of a man's finger.

The next family, *Ophidiidae*, is hardly more important; but the third claims a good deal of attention. It is that of *Pleuronectidae*, or flat-fishes proper.

I have already pointed out that the pomflet is *not* a flat-fish. As he lies, even boiled, on a plate, one can see his blue back, white belly, and one eye only. Turn him over, and the other side is the same, from which any fisherman can learn at the hotel or club where he eats his first breakfast in Bombay, that the pomflet swims *on edge*. It is a general rule with marine creatures that the under colour is the lightest, and this is clearly a protective coloration, for any diver knows that white objects are easiest seen in the water below him, and dark things between him and the surface. The rule is not restricted to the sea, but extends to fresh water, though it is there open to far more numerous exceptions, and it affects not only fish, but nearly all sea fowl, many molluses, aquatic reptiles (as the crocodiles, turtles, and some sea snakes), and to a very limited extent, the aquatic *mammalia*.

Now suppose a sole lying beside the pomflet. He shows only one dark colour on the whole visible surface, but he shows two eyes,

Turn him over, the whole surface now exposed is white, and no eyes are to be found at all. If he could speak, like the fish in the *Arabian Nights*, he could not tell us more plainly that he is a "flat-fish" belonging to the family now under consideration, and acknowledging the presidency of the Turbot.

The most curious thing about these flat-fishes is that their exceptional attitude and coloration, and their preposterous squint, are not congenital, but acquired habits.

The sole starts in life swimming upright, like the pomflet, and with one eye on each side of his head. But early in youth he acquires the habit of lying on one side, the necessities of his life (and probably the conditions of light) bleach that side, darken the upper one, the under eye gets slewed round, distorting the whole brow in the process, and with some curious progressive deformations of his tail, which need not be described here, he becomes a complete sole as we fry him.

The giant of this tribe is the Halibut of the North Pacific and Atlantic, who gets to the dimensions of a reasonable round table. He is followed in size, and much excelled in flavour, by the Turbot, after whom (in Europe) come the Brills and Flounders. All of these are very broad fish, and even the flounders, which are the least of the lot, come to 10 lbs. weight, perhaps more.

The Soles, though closely allied, are much inferior in all three dimensions, especially in "beam." All are marine, though a few pass above tidemarks.

The first division is not very strongly represented in tropical seas. On this coast its chief member is *Psettodes erumei*, which, for want of a better name, I may call the Indian Flounder. It grows to be 15 or 16 inches long, and is of the same flavour as the soles (the northern broad flat-fish differ very much from soles in this respect). It always comes to table, indeed, as a "sole," but flounders do that in other countries without its claim to that honour.

The Maratha name is "bákar," that is, "a cake of unleavened bread," and no doubt some of my readers know that an allied fish is known in Scotland as a "bannock-fluke." (*Vide* the Antiquary's famous deal with Mrs. Mucklebackit.) The tropical soles are numerous, and of various habit. Some species haunt rocks and coral reefs and others sand and mud; the former are often handsomely marked. The sand, however, is the typical ground of the whole tribe, and hence it happens that soles are far less plentiful on the

Konkan Coast than on that of the flat desert regions to the northward.

The flat-fishes close the list of spineless fishes for this coast, and in the next order we shall find plenty of prickles, though they do not extend through the whole fin, as in the Perch and its followers.*

This is the order of *Physostomi*, and the first family, the *Siluridae* or cat-fishes, is one of the most important in India. The fresh water cat-fishes are much the same in the Konkan as above Ghât, very numerous in individuals, and growing to a considerable size, considering the confined waters that they inhabit. *Wallago attu* attains here to about 3 feet in length.

The marine cat-fishes are few in species, but one of the genera, *Arius*, swarms in the estuaries and on muddy bottoms at 5 or 6 fathoms. It is essentially a bottom feeding fish, and does not, I think, go far out to sea. This fish has the extraordinary habit of carrying its eggs in its mouth until hatched. It has an armour-plated head and three spines, being the first rays of the dorsal and pectoral fins. The fry, when hatched, crowd up the estuaries with the tide and do a good deal of submarine scavenging; besides furnishing great sport to the little boys; who catch them by dozens with the simplest tackle. The *Arii* reach eight or ten pounds weight at least, and are said to be good eating. I have not tried them. The Maratha name is "Shingáda" or "Horny fish."

Less common than the *Arii* are two species of *Plotosus*, called in Maratha "Kalan." They are hideous brutes, with pretty much the body of an eel, a round head and a bunch of short thick feelers round the mouth. They have the same dorsal and pectoral spines as the *ariii*, and the wound of these is so much dreaded by the half-naked fishermen that the hauling aboard of a "Kalan" is followed by a general scramble out of his reach. It appears to me that the fish quite understands his weapons, and writhes his body in a jerking fashion so as to strike with the erected pectoral spines. I have often seen one drive the spine deep into other fish lying beside him in the bottom of a boat. It is possible that he may use similar fence in killing fish too large for his comparatively feeble jaws; but this is matter of speculation only. Contrary to the

* Note.—Strictly speaking, classification by fin-prickles refers to the *paired* fins, which in fish represent the limbs of other Vertebrates. But the vertical fins are also important; and what is more, they are only apparently single, being formed by the coalescence of double lateral elements.

habits of the *arius* and of the fresh water siluroids generally, the "Kalan" is a fish of the reefs; and has the clear brown and mottled coloration often characteristic of rock fishes.

In a former paper I mentioned the adipose fin of some Siluroids as characteristic, in the Indian fresh waters. In the sea, however, they are not alone in possessing it. The *Scopelidæ*, or Bombay Duck family, all have it, and have even been classed as trouts on the strength of it.

The most distinguished of the family is certainly the "Bombay Duck" himself (*Harpodon neperus*), in Maratha "Bhombil." "Bummalo" is either low Portuguese, or mere "Bombay bat," and not a pure native word at all.

Every body in Bombay has seen the "Duck" at table, dried or fried, but hardly any European has seen him in his habit as he swims. The scales are fine, and very loose, and they are always rubbed off in the boat long before the fish come ashore, which is an extra merit in a table-fish as no fish-scales are wholesome, and many extremely irritating to the coats of the stomach. I must admit, however, that the naked, flabby-looking fish is not appetizing to look on, and it is best to defer inspection till he has got a new suit of bread-crumbs.

The great commercial merits of the Duck are that his gelatinous flesh dries quickly and safely in the sun, a great matter in a country where the price of salt is artificially multiplied, and that his relatively enormous and powerful jaws, armed with numerous and formidable teeth, can be easily and quickly hitched into those of a brother on the other side of the drying line, to the great saving of labour when many thousand fish have to be hung up. When dried, the Bhombil is not merely a trifle to eat with curry; he is the principal animal food of thousands of the poor, who cannot afford the frequent luxury of *salt* fish; and as for meat, don't taste it twice in the year. Every here and there in the Konkan there are temporary fish markets in the fine weather, to which people from the interior bring grain to barter for bundles of dried "ducks" and "scabbard-fish," to be carried up the foot-paths of the Gháts upon their heads. Besides this, there is a great inward trade by more civilized methods of conveyance.

On one occasion I saw a goat make a raid on the unguarded basket of an absent fish-fag, and eat three or four fresh "bhombils" before the return of the screaming owner drove her off. This, how-

ever, was in Uran; where the brute creation is clean demoralized, insomuch that the cows there are said to steal mhowa spirit, and stagger drunk along the streets. There is a fish much like the "Bombay duck," but inferior as food, (*Saurida tumbil*), which is known in Maratha as the "Chor-Bhombil" ("Chor"=thief), just as we talk of a "horse-mackerel," a "dog-whelk" or a "bastard florican."

After the *Scopelidæ* come the *Salmonidæ*; and it can hardly be too often repeated that there are no indigenous salmon or trout in India; though the Lochleven trout (*Salmo Levenensis*) has been introduced into the Neilgherries, with very doubtful success.

The next family, the *Scombresocidæ*, or Gar fishes and Flying fishes are represented in both fresh and salt water.

These are fishes so long and narrow that some of them are known in the British seas as "Horned eels;" they have, however, nothing of the pliability of the true eels, and their anatomy is altogether different.

In the first genus, *Belone*, the body and both jaws are long and slender, and the latter well-toothed. *Belone cancila* is their representative in fresh water; and *B. strongylurus* the commonest of several marine species.

After them come several species of *Hemiramphi*, or half-beaked fish, in which the upper jaw is short, and the lower very long. All are known in Marathi as "*Tuli*" and all live upon the surface of the water, and furnish, with the scabbard-fishes, most of the diet of our sea-fowl and of the sea-snakes; themselves bound to the surface by necessities of respiration. The fresh water *Belone cancila* is sometimes taken with a fly. They are very fond of playing on the top of the water, and skipping over anything in their way, and often jump into boats. Severe injuries have often been inflicted, in this way, on naked fishermen, by the larger species, which exceed 3 feet in length, and one way of trapping them is to float a net between four sticks, so that if the garfish jump over any stick of the four he falls into the net. They are very fair eating, though a novice is sometimes startled at finding the bones of several species dark bottle-green, almost black.

They usually take a trailing bait well; but are very apt to cut the trace with their teeth.

The second division of this family consists of the well known oceanic flying-fish (*Exocæti*), known in Marathi as "*Chiri*" or

“sparrow-fish.” Unlike the garfishes, which often come close inshore, these affect the deepest water, but like the former, remain near the surface. All readers in Bombay must have seen them in the Arabian Sea. On the coast they are rare, and I get but few specimens, and seldom see them when sailing near Bombay.

One might almost say that at that point about the deep-sea soundings line where you begin to see sea-snakes, you stop seeing flying fish. The best way of observing them is to stand in the very eyes of a steamer, and watch those which fly right ahead, and therefore give the longest view. The general colour is blue above and white below, but several are barred (especially the young) or spotted, and the play of light on their wet scales and pinions is something wonderful. They are, like the rest of the family, very fair eating.

The next family, *Cyprinodontidæ*, is small, and of no account, but its successor, the family of *Cyprinidæ*, or Carps, is of very great importance here, including a great majority of the fresh-water fishes of the Konkan, both by tale of individuals and variety of species. Inland the Cat-fishes rival the Carps, but here we have but few deep and muddy fresh waters fit for cat-fishes, and so these are only locally common in fresh water.

For the purposes of this paper, we may divide the *Cyprinidæ* into three sub-families, the first of which is composed of the loaches. These and the Alpine carps (*Discognathi*), have been already disposed of, in dealing with the Konkan-ghát-máta.

The second (this present division is rather convenient than scientific) includes the “Rohos” (*Labeo*) which in appearance and habit, most approach the European carp, the type of the family; being all vegetable-feeders, with a preference for comparatively still waters. The typical Roho himself (*Labeo Rohita*) is not found here at all, and his place is taken by *Labeo Calbasu*, and (I think) *L. dussumieri*.

The former is described by Major Beavan as “dark in colour, generally blotchy, and very slimy,” but I do not find that this applies to specimens taken from clear streams in the hot weather, which were bright and clean, with many of the scales about the deepest part of the side spotted scarlet. Dr. Day also notices this coloration; and it has to be noted that he had personal experience of this fish on the West Coast, which Beavan had not. All the *Cyprinidæ* are very liable to local variation in colour, and sometimes even in shape.

The Barbels, so far as they have a choice, prefer comparatively rapid waters, and are in this country mostly omnivorous. The typical Mahseer (*Barbus tor*) is not, to the best of my knowledge, found here, but is represented by a fish I have doubtfully identified as the gold-finned Barbel (*B. pinnauratus*), which grows to about 10 lbs. weight, perhaps more, and as a sporting fish, is quite equal to any Mahseer, weight for weight. Here, as elsewhere, the live-bait is the most killing fashion of angling for barbel, and I have had no success with spinning-baits, and have not tried the fly in the Konkan. I do not think it would be found effective for the larger fish, but probably a good many of the smaller Cyprinoids, as *Rasbora daniconius* and the *Chelas*, and the fresh water Gar-fish mentioned on a former page could be taken with a light trout rod and midge flies, especially if bright coloured.

But the fresh water angling of the Konkan is, on the whole, poor. The lowlands are nearly all under rice, and in the rains every rice-field is a fish-trap, and every stream studded with weirs. The fish that go up to spawn seldom return alive, and the fry are taken in thousands, and serve to eke out the scanty meals of the labourers. Within my own memory, the few waters where tolerable angling could be had have greatly fallen off, and the stock seems to be only kept up by the inhabitants of a few more or less sacred pools and tanks.

Some of these are well stocked. In one, particularly, I have seen hundreds of sacred barbel come together to be fed. All were, apparently, of one species; and similarly another sanctuary seemed to be mostly inhabited by cat-fishes, which must have lived chiefly on each other, had it not been for the offerings of good Hindus. As it is, I suspect that they supplemented their charitable allowance by cannibalism.

The natives believe that even the otter and osprey respect these pools, and that the only European who had so little sense and good taste as to fish them, not only failed, but died of fever. I must say that he deserved the failure, but the fever was more than one could wish him.

The *Cyprinidæ* proper are exclusively fresh water fish, but some naturalists class with them the Herrings, Sprats, and Shads (*Clupeidæ*), which come next in our classification. These are mostly sea-fishes; a few live exclusively in fresh water, and most of these will take a midge fly, but as they like deep and still waters (though living

chiefly on the surface) these fresh-water herrings are not very common in the Konkan. The *Chelas*, a genus of true *Cyprinidæ* which show considerable external resemblance to this family, take their place.

The Shads are anadromous, *i.e.*, run up rivers to spawn, but the Konkan streams are not big enough for them, and, besides, are very often barred by weirs. We do not therefore often get the Shads here "fresh-run," that is, in that stage of gravidity in which they seek the fresh water to spawn, which is with them, as with the European salmon and sea-trout, the best condition for the table. It is probably for this reason that the "Palla" (*Clupea ilisha*, the "Hilsa-fish" and "Sable-fish" of other parts), is not very common here, and but little esteemed. Another thing against it is that, like all the family, it dies and decays quickly. Now the Bombay fish supply is so organized that only fish which keep very well indeed (as the pomflet) have any chance of getting to table while still fit to eat. I have, however, occasionally got very tolerable "Palla-fish" even in Bombay itself, and more often down the Coast.

Some philosophers have maintained that this fish has given its name to the "Apollo" pier in Bombay, but there is this against the derivation, that native fishermen do not call the place "Palla Bandar" but "Pálú Bandar," and don't connect the name with this or any other fish.

The allied marine species are very numerous.

One worth noticing is the "Milk-fish" or "Kedi" (*Chanos salmoneus*), much esteemed further south under the name of "White mullet." It has been successfully acclimatized in fresh water tanks, and is a handsome fish, of good quality when fresh, running to 3 feet long.

We have two pretty common "sprats" or sardines, the oil sardine (*Clupea longiceps*) and the rat-tailed sardines or "Mandils" (genus *Coilia*, several species). These come in great shoals in the cold weather, and are extremely good eating when fresh, like their European cousins.

The way to get them and the mackerel is to have a net hauled on the beach near one's quarters just before breakfast-time. If the fish are in-shore at all at the time, the net is pretty sure to take enough for a meal, and the fishermen are content with a few annas.

The two next families are small, and classed by some with the herrings. The first "*Chirocentridæ*," contains one Indian sea-fish,

the "Karli" (*Chirocentrus dorab*), which may be described as a sort of solitary and predatory herring. It is very long-shaped, with a sort of bull-head, and formidable teeth, which it uses very freely. The second, the *Notopteridæ*, has only two fishes, the queer "wambhs," (*Notopterus kapirot* and *N. chitala*), both fresh-water forms, mentioned before as known in Deccan waters. They are fair eating, and bite freely at a worm or bit of meat, but show no fight. In Upper India they are said to have an unholy taste for human flesh, but as we don't in these parts ground-bait our sacred streams with roasted humanity, we need not mind such a trifle here.

The next family, that of the *Symbranchidæ*, is not, I think, represented in our waters. It has few members, queer eel-shaped fish mostly capable of breathing air. At least one species, *Amphipnous cuchia*, can remain torpid in mud for a long period.

We now come to the true eels, or *Muraenidæ*. I have only got one species of fresh-water eel in the Konkan, *Anguilla bengalensis*, which very much resembles the English eel, but has rather more variety of colour, mottlings and shadings of olive brown along the sides. It reaches about 5 lbs. weight, perhaps more. It is usually caught by the natives on trimmers, and is very fair eating, but is not common.

The sea-eels are very numerous in species and individuals.

The commonest are the "Isars" (*Muraena*), of which one species, (*M. tessellata*), is very beautifully reticulate. They haunt reefs, and are often taken with the hook and line. The same remarks apply to the genus *Uroconger*, of which we have but one species, the "Mulan" (*U. lepturus*).

The *Muraenesoces*, or Eel-pikes, are fishes of deeper water and muddy bottoms, but often swim near the surface. They are remarkable for their large size and formidable dentition. *Muraenesox telabon*, the "Waw," or "fathom-fish," is said to reach 10 ft. long, and its jaws are fully one-eighth of the total length, and studded with long and sharp fangs. Besides the jaw-teeth, most of these sea-eels have a central row of still more powerful fangs on the palate, and their bite is much dreaded by fishermen.

We have in our Museum specimens of several species, and of the spawn. They are nearly all fairly good second-rate fish for the table.

Here we come to the end of the order of *Physostomi*, and begin with the *Lophobranchii*, or armour-clad fishes, most of which are

more or less encased in bony plates. The most noticeable are the *Syngnathi*, or "pipe-fishes," with two long jaws combined into a tube, and *Hippocampi*, or sea-horses, so called because their head and neck form a curious caricature of a conventional horse-head. They are mostly marine, small, and not very common, but as the most part of them consists of the bony armour, with a very small lining of flesh, they are easily dried, and make good specimens in that condition, being fixed, while fresh, with wires, in any attitude that pleases the artist. They have generally some arrangement for carrying their eggs about with them till hatched, and it seems that this duty is discharged by both sexes. We have several specimens of both *Hippocampus* and *Syngnathus* in our Museum.

The next order is that of the *Plectognathi*, and the first family in it are the *Sclerodermi*, beginning with the genus *Triacanthus*. The *Triacanthi* are awkward ugly fishes, with a profile suggesting that of an old horse, whence the Maratha name "ghora." They have one very strong dorsal spine, and two pectoral, a file-like skin, and unwholesome flesh. They are not uncommon here.

The next genus, *Balistes*, is not so ugly in form, being somewhat like the typical perches in shape, but deeper and blunter. The skin is still raspy, the flesh unwholesome, the dorsal fin has a strong but blunt spine, and ventrals are reduced to a mere bony excrescence, of no obvious use.

A third genus, *Monacanthus*, rather resembles *Triacanthus*, but has only one spine, dorsal of course. We have specimens of all three genera, the latter two are rather rare here.

This family contains also the extraordinary *Ostracions*, which are completely armour-plated, with a bluff upright forehead, and some have horns like a bull. I have got none here.

They are followed by a very curious family, the *Gymnodontes*, or naked-toothed fishes. In these, instead of the claw-like fangs of fishes in general, we have each jaw armed with a sort of bony beak, sometimes divided by sutures into two portions.

In the first fish which I shall notice, however, there are no such seams, each jaw is in one piece, whence the name *Diodon hystrix*, or the two-toothed Porcupine (sc. fish). The surname it owes to a complete set of horny spines $\frac{3}{4}$ of an inch long, covering the whole body. I have got here two specimens, one alive. It seemed to have little power of erecting the spines, but was very difficult to handle all the same.

It is a short, puffy-looking brute, with some power of blowing itself out into a balloon shape, but it is (to judge from my living fish) by no means a match in this art for some of its neighbours, to be presently noticed.

After *Diodon* comes *Triodon*, with two "teeth" in the upper jaw, and one in the lower. I have not got any specimens here.

The next genus is *Xenopterus*, which we have not got, but which I cannot refrain from noticing, for the benefit of members ordered to Burma. It is a yarn of the Burmese that these little fishes, when they see a man or any other large animal in the water, fall upon him in shoals, and bite little bits out of him till there is none left. Retaliation in kind is impossible or nearly so, as the whole family of Gymnodonts are bad eating, in degrees which range from mere nastiness up to sheer poisonousness.

After this amiable creature come the *Tetrodons*, or Parrot-fishes, with two so-called "teeth" in each jaw, very abundant here, and known to Marathas as "Ken." They do a lot of harm to tackle by biting through it, and when caught are useless, but lie open to retaliation of a sort, as they survive for some time out of water, and are always on landing "handed over to the tormentors," namely, gamins of the port. Now it is a character of the parrot-fishes that when irritated they puff themselves out like footballs and each small boy who has got hold of one forthwith proceeds to tickle the fish's stomach, a sufficiently ludicrous process to watch. When the parrot-fish, under this stimulus, has blown himself out as far as he can, the small boy lays him carefully down on the sand, and then, retiring a few paces, executes a hop-skip-and-a-jump, alighting with both heels close together on the unhappy *Tetrodon*, who of course goes off with a loud "pop," (like a grocer's paper-bag similarly treated), amid yells of delight from the "marine light infantry."

The parrot-fishes are the last of the *Teleostei*, or fishes with a complete bony skeleton. We now come to the cartilaginous or gristly sharks and rays, which, although usually of large size, are of very low organization, the proletariat of fishes. The "*Selachoid*" Sharks and Dog-fishes take precedence, "the best of a bad lot,"* They are usually to a great extent cylindrical, or rather cigar-

* Certain philosophers have maintained that these brutes instead of being the canaille of fishes, ought to be classed at their head. All I can say to this is that I wish them a closer acquaintance with their clients.

shaped, in form, though some are very flat-chested, showing an approach to the rays. *The gill opening are on the upper surface,* and the upper vane of the tail is the longest (heterocercal).

There is no standing scientific distinction between Sharks and Dog-fishes. The latter is simply a term applied by fishermen to all small *Selachoid* fishes, and often to the young of the larger species, which, as with other fry, are very apt to swarm in-shore, perhaps partly with a view to keeping out of jaw-range of their elders. This is particularly the case on our coast.

Some naturalists translate "*Scylliidae*" by "dog-fish," and the name was undoubtedly originally connected with the sea-hounds of the mythical Scylla. But the *Scylliidae* as now restricted are spineless, and the "piky Dog-fishes" (*Spinax*) of the North Atlantic, which are armed with a very formidable dorsal spine, have too strong a hold on their name to be deprived of it by any classifier. The term "dog-fish," therefore, cannot now be used as the equivalent of any Latin scientific name, and must continue to be a popular term for small sharks in general. In this country, perhaps, we had better get on without it.

Our leading sharks are the *Carchariidae*, one of which, *Carcharias gangeticus*, is said to be much dreaded at Calcutta, under the name of "ground shark," which is not in itself of much use. All the large predatory sharks swim high or low according to the position of their food, and the only species which habitually keep to the bottom are the harmless kinds that prey mostly on shell fish and crabs.

No sharks are considered dangerous on this coast. The large ones generally keep well off shore, in from 7 to 12 fathoms of water, and the fishermen do not care two-pence about them, except to cut their fins off, and sell them for export to China. I cannot help suspecting that there must be local causes for the reported ferocity of the Calcutta sharks. Possibly the throwing of dead bodies into the rivers may have something to say to it.

One of our sharks, *Carcharias tricuspidatus*, is said to reach twenty feet long further north. I have not myself seen any here of half that length.

The genus *Lamna* is closely allied to *Carcharias* (if really separate at all), but has only one species here, though represented in the Atlantic by the famous "White Shark," and many others."

Another genus, "*Galeocerdo*," contains the "tiger-sharks," so called from their markings and bad temper; they are said to be

much dreaded down the coast, and to one species is attributed the curious practice of laying itself out for dead, to tempt smaller fishes, which come to dine, and find the tables turned on them. I have not got any specimens here.

Next come the "hammer heads" and "shovel-heads," both of the genus *Zygæna*, most hideous brutes, named according to their respective deformities. A monster-gooseberry paragraph went round the Indian papers lately, about some huge "shovel-headed sharks," spotted like the pard, and capable of taking their prey without turning over, seen in the Red Sea. Curiously enough some one went to the trouble of suggesting "*Stegostoma tigrinum*," which is indeed striped (no shovel-headed shark is) but is a ground-shark, or rather dog-fish, and seldom exceeds 5 feet long.

All sharks, and the shovel-heads as much as any others, must either *get over* their prey, or turn on their backs to seize it from below, and they prefer the former manœuvre themselves, but as they are usually observed at the surface, the latter is best known to the public.

The *Zygænas* are credited with great ferocity, chiefly, I suspect, from their ill looks. As a matter of fact the conformation of their head, jaws, and breast, is against this, and indicates an approach to the rays, and a life at the bottom, supported on prey of comparatively small size. They have nothing like the gape of *Carcharias*.

The *Scyllidæ* proper are small and comparatively sluggish and harmless *Selachoids*, feeding mostly at the bottom upon carrion, molluscs and crustacea, spineless, and usually spotted or striped. Some have two barbels. We have several species, the most noticeable here is the *Stegostoma tigrinum* above referred to, a curious and quite harmless creature, which could not bite a man, unless he put his finger in its mouth. We have two specimens in our Museum.

We have none of the spined Dog-fishes in our seas. They are a very plague to the fisheries of the British Isles, and are also notable as being ovo-viviparous. I do not know whether any Indian shark has this character. Their place is taken here, as hinted above, by the fry of the large *Carchariidæ*.

The second sub-order of the Cartilaginous fishes is that of the *Batoidei*, or saw-fishes, skates, and rays. They are all more or less flat-chested; and some of them even broader than they are long (omitting the tail). They all have their gill openings below, and live as a rule, mostly at the bottom, though sometimes they come to

the surface, and "squatter" along it in a curious way, or even leap high out of the water, apparently for their own diversion. The mouth is usually small, and except in the upper jaw of the saw-fish the teeth are small, blunt, and close set, often forming a sort of pavement. The jaws of most of them are very powerful, and between these they crush and grind the shell-fish and crustacea which are, in most cases, "the chief of their diet."

The first family among them is that of *Pristidæ*, or Saw-fishes, called by the Marathas "Sonála," and by Europeans often (incorrectly, of course,) "Sword-fishes." In these the snout and upper jaw are prolonged into a flat round-ended beak, about one-fourth of the whole length of the fish, which sometimes exceeds 20 feet. Both sides of this are set, rake-fashion, with long flattened horny fangs, and the fish is said to use this formidable weapon by swimming rapidly past the victim, so as to deliver a sawing cut with all the teeth on one side in succession, or by writhing so as to strike side-ways with the points of so many teeth as may bear upon the object at once, inflicting a series of punctured wounds, and perhaps retaining the victim (if small) impaled upon the teeth. The former manner of fence is said to be used upon large fish, porpoises, and even men, and the latter upon small fish. The fishermen of the coast hold these saw-fishes in great fear (though they make no account of sharks).

The general shape of the saw-fish is not unlike that of a shark, but he is clumsier and flatter. The fins, which are very large and powerful, are exported as "shark-fins." Several species ascend rivers, and in sandy streams go far above tide-marks, but they have no great chance of doing this in the Konkan.

After them comes the curious family of the *Rhinobatidæ*, which have something the figure of the saw-fish, but are broader, and in most species of their two genera (*Rhynchobatus* and *Rhinobatus*), the snout is prolonged into a sort of triangular shovel. This, however, is above the jaw, and is unarmed, the mouth is that of a true skate, with a pair of rasps for jaws. The fish of this type are known to the Marathas as "Lánjá." One species at least (*Rhynchobatus djeddensis*) is very common on our coast, and grows to at least 6 feet long. The only round-snouted species, which is called "Mivil" (*R. ancylostomus*) is exceedingly rare. I have only once seen it. It exceeds six feet. The Rhinobati are said to be rather larger, but they are all timid creatures, and the principal evil reported of them is a

taste for pearl oysters. Their flesh is said by Dr. Day to be "considered nourishing," but is not much thought of here; the large liver is used to make oil of, and the fins pass for shark-fins in the trade.

After them comes the wonderful little family of the *Torpedos*, or electric rays. These have very much the outlines of a somewhat flattened tadpole, and nothing could suggest electricity less than their appearance. But they can give a shock sufficient to make a man sing out.

We have but two species, *Astrape dipterygia*, which is brown and white, and has one dorsal fin, and *Narcine timlei*, with two dorsals, and a sort of dull tortoise-shell coloration. We have both in our Museum, and I have had living specimens of both. They appear to live on the edges of reefs, feeding on small crustacea and molluscs, and I do not think that they can have much use for their curious power in foraging. It may, of course, protect them to some extent against larger fish. Neither species gets beyond eighteen inches long. I doubt if *Astrape* ever exceeds a foot.

The native fishermen call both species "Gingina," which is their name for any tingling sensation, such as that caused by a blow on the nerve of the elbow, or, as we say, the "funny-bone." The name may therefore be translated "tingling-fish." They use the creatures, characteristically enough, in a time-honoured practical joke, concealing them amongst other fish in a bucket, which is then handed over to one of the boys who are always marauding about the ports. The small boy is sure to stick his hand among the fish, and as sure to drop the bucket with a yell, amid the roars of his neighbours. Then all the little boys get together, and try to take the torpedo out of the bucket, just as you may see boys at home, who have got a toy electric machine, doing with a sixpence in a basin of water. The fish soon exhausts his battery, and can then be handled with impunity.

After these torpedos come the *Raiidæ*, or rays proper, represented in India by one fish, *Platyrrhina schonleini*, which I have not found here; and then an important family, the *Trygonidæ*, or sting-rays, called in Maratha "Phákate." These are all lozenge-shaped creatures, generally broader than long, bar the tail, which is long and whip-like, and often armed with one, two, or three caudal spines long, sharp, and barbed all down both sides like some sort of a cannibal harpoon. The natives say that they wind the tail round

their victims and then stab them to death with this case of daggers, which always reminds me of an Arab or Makráni swash-buckler with three jambiyas in one sheath. So far as I can observe, however, the tail is not really in any way prehensile, and takes no more hold than a very supple cane or whip would. It is apparently very liable to accident, a perfect tail is as scarce amongst veteran rays as amongst Bombay "Biles" at the end of the season. But I did get one fine specimen of the typical species (*Trygon Uarnak*), in which it seemed perfect, and the measurements were as follows:—maximum diameter 6 feet, length without tail $5\frac{1}{2}$ feet, tail $8\frac{1}{2}$ feet. The tail spine had been broken off and lost, the stump was one inch across, and from a number of measurements of other spines I find that their length is to diameter in a proportion that varies from $\times 7$ to $\times 10$. This spine, therefore, cannot have been less than 6 inches long, and may have been 10. I could hardly blame the fishermen for breaking it off before getting the monster aboard. They dread these rays almost as much as the saw-fishes.

Dr. Day allows this species a tail three or four times its own length, so my friend might have had a tail 22 feet long, but the longest of which I have good record on this coast is one mentioned in the "Tanna Gazetteer" as of $13\frac{1}{2}$ feet. Several other Trygons, and the allied genera *Tænicura* and *Pteroplatea*, are as big, and as well armed. They live mostly on muddy bottoms, hunting crustacea and molluscs but at times, as noted above, rise and play and leap on the surface.

In the next family, *Myliobatidae*, this habit is still more common, and some have spines on the tail, but in the first genus, *Myliobatis*, they are not universal. It is represented on this coast, I think, by the "Hanwatia" or "monkey-skate," a small unarmed fish frequenting the edges of reefs, and handsomely spotted, probably *Myliobates maculata*.

The rest of this family are more or less hideous and monstrous, but the palm belongs to the Bat-ray, or Devil-fish (*Dicerobatis eregoodoo*), called in Maratha "Piwri." This monster is twice as broad as he is long, reaching 18 feet across the wings and 9 from the snout to the root of the tail, which is $1\frac{1}{2}$ times the length of the body, if not shortened by accident. On his head he has two projections somewhat of the shape of hare's ears, directed forwards. He appears usually to swim high, and I have seen one jump a good six feet out of the water. The only good thing to be said about him is that he has no spine in his tail.

These big skates are no doubt amongst the wonders of the sea, and make one think of the "Kraken." But the best story of one that I know is in a book called "Blue Water," the author whereof maintains that he saw at sea a skate which he took to be *seventy feet* across the wings, "Noo," as the Scotchman said, "we'll see what can be dune aboot the breadth of the skate." In the first instance, the writer, a Mr. Keane, was at one time known in Bombay as the author of a very quiet and "verisimilous" narrative of a pilgrimage to Mecca, contributed to a daily paper here. Secondly, in the same book, he deals with other fishes in a style free from exaggeration or romance, and indeed his remarks upon sharks are very valuable, on account of the care taken to strip the subject of its usual envelope of tall talk. Finally, his description of the big skate's proceedings is clearly taken from observation of a big skate on the top of the water, the opportunity for which, and the power of using it, are not very often found. The monstrous dimensions that I have assigned to the Bat-Ray are taken from Sir Walter Elliot's measurement, and are well known to be equalled by some American *Batoidei*.

It appears to me that, making every allowance for the fact that Mr. Keane's Kraken did not stop to be measured, he may fairly be credited with a breadth of 40 feet, and if his proportions were those of *Dicerobatis* (which is about the shortest tailed of the family), his tail may have been 30 feet of a total length of 50, allowing for its curtailment by accidents in his necessarily long life.

Such an animal, swimming and playing near the surface, would account for any amount of sea-serpent stories, and especially for those in which the serpent attacks a whale, represented by the body of the fish. There is nothing in the nature of things to prevent the large Batoid fishes from ranging from 4 feet long to 50, any more than in the case of the cetacean mammals, which do so on this very coast. I have shown cause above for believing that the sea-serpent, whatever he is, belongs to no known type of marine Ophidia.

As my penultimate fish is the biggest on record, my very last shall be one of the smallest, if indeed it be a fish at all. In the water, it is simply a black dot with a silvery rim or edge. But on removal, this is seen to be the eye of a purely transparent gelatinous creature having the shape of a very narrow sole, but swimming upright, quite symmetrical, and about 3 inches long (in the largest specimens). On immersion in spirit it assumes a dead semi-opaque

white colour, and seems to show some trace of a vertebral system. Several specimens are in our collection.*

ON BOTS (LARVAL ŒSTRIDÆ) OF THE HORSE AND CAMEL.

BY VETERINARY SURGEON J. H. STEEL, A.V.D.,
Superintendent, Bombay Veterinary College.

I WISH, in the following short paper, to contrast the external conformation of *Pharyngobalus cameli* with that of *Gastrophilus equi*; in other words, the larval gadfly of the camel with the less maggot-like larva of the common horse gadfly.

I trust from this slight study to deduce results of no small interest and general importance, as well as to indicate some points on which I have not been able to assure myself, and concerning which perhaps other workers may be able to enlighten me either at once or as the result of investigation.

These bots are maggots which live in the alimentary canal. They differ much in appearance from each other and from ordinary maggots, and in the details of structure they are, respectively, excellently adapted to the situations they occupy.

Practical observers have long noted "maggots" coming from the nose of the camel, a little different from ordinary maggot's. But the noses of camels, especially, are liable to lacerated wounds, from the nose peg and other causes, which in a tropical climate and on active service are sought out by the common fly and soon become the seat of development of common maggots innumerable.

* Angling in the Konkan is so very poor a business that no one need go out of his way for it. But a fair evening's sport can sometimes be had with a fly-rod of 12 to 15 feet and fine tackle, a light small float, and a small hook on strong gut. The best bait is made of the dwarf or fry barbels, cut short behind to not more than an inch long; and hooked through below the spine; under the shoulder. The method of fishing is as with live-bait. There should be a grain or two of shot on the trace, and the bait should be about half way to the bottom. A landing net is desirable. A private correspondent referring to my remarks on the Barbels of the Deccan (Vol. 1, p. 100), says that the typical European Barbel, though usually found in comparatively still waters in England, does on the Continent of Europe (and specially on the Upper Rhine) frequent rapids like our mahseers. Also that the allied fish referred to by me as called "shell-fish" in German must be this species, "Burbot" and "Burbolt," being both names of the English "eel-pout," a fish of another family altogether. Further that this name (the German equivalent of "shell-fish," whatever it may be) is assigned in German dictionaries to *salt-cod*.

A correspondent in Bombay has promised to add to my list of Konkan water-fowl; and I shall be very glad if any one else will do so too. The notes of any single observer must necessarily leave much room for such addenda.

Inspecting Veterinary Surgeon Burt in his recent Report on the operations along the Nile, says that maggots in the nostrils caused great inconvenience, an offensive discharge tinged with blood, and a continual shaking of the head, the camels being dull, off-feed, and the maggots larger than those in wounds and "more resembling a grub," I. V. S. Oliphant records their frequent occurrence in Afghanistan during the 1878-79 Campaign and V. S. (1st Cl.) Rayment noted their frequency in the Soudan. V. S. Fenton brought me some specimens when he returned from Suakim this year with the Madras Troops, from these specimens I derive the following conclusions:—

The camel bot is half as big again as that of the horse, is much softer and more tapering towards the hookless extremity, whereas it is blunter and much more compressed towards the hooked end, while the section of the horse bot is evenly oval, that of the camel bot is flattened on the lower surface. In both the body-rings bearing *spines* are nine in number and the spines point from the hook end. The following contrasted list of characters may best be given in the tabulated form:—

HORSE BOT.

Spines.—Small, hard, sharp, very numerous on each ring and largest on the central rings. Small extra spines alternate with the main ones and are situated behind and in the intervals between them, forming as it were, two rows in each circle. The bulging parts between the rings are smooth.

Hook-end.—Hooks brownish-black and sharply divergent, short and much curved, situated inferiorly near the extremity of a long narrow hook-end. A central organ of chitine is midway between the bases of the hooks, and there are a few spinelets above and on either side of two well marked

CAMEL BOT.

Spines.—Fleshy and in single row, very large, teat-like, and blunt. The largest are in the central rings, but not markedly so. The main spines vary in size and tend to collect into groups with spaces between them. Those on the lateral parts of the lower surface tend to develope into temporary feet. On the most projecting parts of the segments between the rings of spines are small spinelets which below are very numerous and form continuous bands. In the different parts of the body the teat-like spines vary in relative position (*vide* diagram).

Hook-end.—Hooks black; diverge at an acute angle and are slender, long, and little curved, situated below the anterior extremity and beneath a 6-lobed mass surrounded above and on each side by irregular circlelets of spinelets which communicate at each extremity with the first zone of

sense organs (situated above the hooks). These sense organs are all but sessile. The first row of spines is complete.

hooklets above and below. This first zone is a very irregular one. There is no chitinous organ between the hooks. The pigmented sense organs are on long peduncles the bases of which are connected by a band. There is another transverse band below the hooks. The first row of spines is deficient inferiorly.

Hookless or orifice end.—Opening oblong. Its cavity black throughout. Its lips transversely bifid and the lower one much larger than the upper. The upper one continuous laterally with the side lobes. The last segments are arranged telescopically and bear no appreciable spinelets.

Hookless or orifice end.—Opening an almost circular cavity, black only in two lateral spots, upper lip semi-circular and with four well marked angles, lower bifid, consisting of a tubercous part elongated transversely and also of two bifid protuberances each bearing a mammillary process. There are spinelets on the two latter and on the lower lip. The general aspect of the opening is upward. Last segment irregularly telescopic

These characters amply prove that the camel bot serves as a connecting link between the peculiar tough horse bot and ordinary maggots, they show that the strange leathery spines of the horse bot are not chitinous or horny nails but true papillæ, they show that these papillæ tend to arrange themselves in groups and some develop into foot-like organs while the others lose their importance. By contrast of these organisms with common maggots we may infer what features of structure are necessary for a grub that lives in the stomach (as the horse bot does) and what for a resident in the pharynx (as the camel bot). The latter it will be noticed is softer and less irritant than the former and probably, as having rudimentary false legs, a much better traveller. He makes his exit from the body through the nose, whereas the stomach bot of the horse passes through the anus. The difference in position of the hooks is interesting; the camel parasite has them arranged like a pair of delicate anchors which he can throw down when he wishes to obtain a grip sufficing to prevent his being swallowed with food, whereas the horse parasite has much stronger grappling hooks arranged like the horns of a stag beetle and suited to enable him to hold tight in whatever direction the churning motion of the stomach may drag him.

The posterior orifice-like cavity is considered a respiratory sac, but what the black material in it is I am not prepared to state. Why does the camel parasite have stalked eyes and the horse parasite stalkless ones? Why has the latter only the chitinous organ between the hooks? And why should the lips of the orifice of the camel parasite developed into artistically arranged lobes while those of the horse bot are severely devoid of ornaments? All these and many other problems suggest themselves in the study of these peculiar creatures.

The continuous irritation produced in the nostrils and pharynges of our poor camels exiled to the shores of the Red Sea, the probability that a certain amount of their now historic exhaustion depended on these bots, and the certainty that in future Campaigns where camel transport is used these parasites must be remembered and got rid of, give the *Cestrus Cameli* a considerable practical veterinary interest.

PARASITES IN THE WILD ASS OF CUTCH.

By V. S. JOHN HENRY STEEL, A.V.D.

Superintendent, Bombay Veterinary College.

THROUGH the kindness of Messrs. Sterndale and Phipson I was, in July of the present year, placed in possession of the carcase of a young wild ass from Cutch. The animal had been strangled in attempts to ship it for England. The skin was handed over to the Society for preservation, the hoofs and skeleton have been retained by me, and I examined the carcase carefully for parasites. This was all that could be done under the circumstances, our dissecting room being then not ready for use and our operations in *post-mortem* examination conducted under a downpour of rain, in the open. The investigation showed beautiful development of the muscles (and especially their tendinous portions) of the limbs, and the lesions of strangling were well marked. As concerns parasites I wished especially to make careful examination because I had recently opposed the popular view that these beings do not occur in wild animals to such a degree as in domesticated, and that in the latter they must be considered pathological rather than in their natural *habitat*. I thought if horses standing in the open have more parasites than those more carefully tended, surely animals in the

jungle should still more be invaded by the various Entozoa. In the case under examination everything was against my being able to establish my theory; the animal was young, and old animals though they suffer least from parasitic invasion are more often the victims of it than young, the ass came from a part of the country wherein salt marsh is frequent and, as is well known, salt pastures are prejudicial to most forms of parasite.

The result, however, was as follows :—

- A. *Stomach*.—Cysts, and spiroptera either from these cysts or of the species which inhabits the stomach cavity.

Bots.

Ascaris megalcephala.

- B. *Small Intestine*.—*Ascaris megalcephala*, in enormous numbers, some seventy of these very large round worms being obtained from the stomach and small intestine.

- C. *Cæcum and commencement portion of the Colon*.—Cysts with small white worms both in them and in the cavity of the bowel.

Strongylus armatus.

- D. *Rectum*.—Oxyurides—a few.

- E. *Anterior Mesenteric Artery*.—One immature *Strongylus armatus*.

Liver, lungs, and peritoneal cavity apparently free from invasion.

Thus five localities were infested, the parasites found being of at least six different species and some forms of them extremely numerous. The following points seems to me worthy of comment:—

(1.) The parasites above enumerated must be obtainable by animals out on natural pasturage. This is likely to be a useful hint as regards their prevention in domesticated equines: whether these species are obtainable in spite of saline pasturage or no it is impossible to say, but one feels inclined to consider such a view supported by the circumstances of the case; at any rate it is a point worth investigation in the future.

(2.) It is evident that parasitic invasion is not by any means an infliction on animals following solely in the train of domestication. It has been authoritatively stated that *Strongylus armatus* is never found in the wild ass although it is of almost constant occurrence in old domesticated donkeys, my observations distinctly prove this to be an error, probably at some other season of the year the anterior mesenteric artery would have been found crammed with the

immature worms, but the single specimen I found there amply suffices to establish my position.

(3.) The absence of the following common species of equine parasites should be noted :—*Fasciola hepatica*, *Strongylus micrurus*, *Filaria Papillosa*, Hydatids, and Amphistomes.

(4.) The numerical preponderance of *Ascarides* is interesting, for these parasites are, according to my observations, rather rare in domesticated equines in this country.

(5.) Cysts with small white worms in the large bowel are rare. They were very numerous and did not resemble the immature *Str. tetracanthus*. Indeed they rather reminded one of the Spiroptera found in the stomach. I have not made a detailed examination of the specimens, but if they be Spiroptera from the cœcum, this is remarkable, as also would be the absence of *Str. tetracanthus*, so frequent in domesticated equines.

(6.) It is interesting to observe that the parasites which infest the wild ass are of the same species as those found in the domesticated horses.

DESCRIPTION OF THREE NEW SPECIES OF HYDROPHIS FROM THE BOMBAY HARBOUR AND THE MEKRAN COAST.

BY JAMES A. MURRAY.

HYDROPHIS PHIPSONI. *Sp. Nov.*

HEAD scarcely distinct from neck; rostral pentagonal, as high as wide; length of nasal $1\frac{1}{4}$, its greatest width; vertical subtriangular in front, tapering behind, and fitting into a nearly triangular furcation between the occipitals; the length of each occipital is twice its greatest width. 3—4 temporals on the side of each occipital, the anterior the largest and separated from the 6th upper labial by an intervening shield. 7 upper labials, the 3rd, 4th, and 5th under the eye. 9 small and 2 large lower labials, the 1st on each side in contact behind the triangular mental, the 3rd, 4th, 5th, 6th, and 7th have three large shields below them. Two pairs of chin shields in contact with each other. One præ and one post-ocular, the latter in suture with the superciliary, occipital, anterior temporal, the intervening shield between the 5th and 6th upper labials and the upper edge of the 5th labial.

Scales carinate mesially, the carina strong on the vertebral region and breaking up into tubercles posteriorly; laterally the scales are feebly carinate. Scales round the neck in 36—38 series; round the highest part of the body in 40—42 series. Ventrals entire, twice the size of the adjoining scales and bituberculate.

Colours.—Yellowish ochrey, with a wide black dorsal stripe, a faint one on each side of the body, and a fourth one along the whole extent of the ventrals—the lateral stripe gradually disappears with age. Head black, with a horse-shoe shaped yellow band from the frontals to behind and above the gape. Tail black.

Length.—30 inches, of which the tail is 2 inches.

Hab.—Bombay Seas.

I have much pleasure in associating with this species the name of our worthy and energetic Secretary, Mr. H. M. Phipson, in whose collection the first specimen of this interesting species was found.

HYDROPHIS GUTTATA. *Sp. nov.*

Head longer than broad, scarcely distinct from neck; body stout; 40 series of scales round the neck, 54 round the highest part of the body, and 17 on each side of the tail. Scales imbricate, keeled, each keel interrupted in the middle; posteriorly on many scales they are bituberculate. Rostral 5-sided, lobuliform below, with a deep notch on each side. Nasals higher than wide, in contact laterally with the 1st and two-thirds of the 2nd upper labial; frontals in suture on each side with the single præocular and posterior third of the second upper labial; vertical hexagonal, pointed behind and rather longer than its greatest breadth; each occipital as long as broad; a large scale between the furcation of the pair. Temporals three, the hindmost largest; the first longer than wide, obliquely placed and in contact with the post-oculars and two large shields above the 7th, 8th, and 9th upper labials. Upper labials 9, the 4th and a subtriangular shield above the 5th and 6th labials enter the eye. One præ and two post-oculars. Superciliary one on each side, but mesially in its upper third and grooved below. *No chin shields*; 12 lower labials; two obliquely placed elongate shields twice as long as broad, below the 4th and 5th labials, and a quadrangular one between the 6th and 7th; 19 scales between the 1st lower labial and 1st ventral shield. Ventrals 265 in number, bifid, and arranged opposite to each other. They are scarcely as large as the adjoining scales. 3 enlarged anal shields; 43 series of scales along the lower edge of the tail to the terminal notch.

Length.—42 inches, of which the tail is $5 \times 1\frac{1}{2}$ inches.

Colours.—Yellow, becoming ochrey beyond the middle of the trunk. Head olive. Forepart of trunk with 10 ovate black spots on the vertebral region, separated by a single series of yellow scales; laterally these 10 interspaces are divided by a narrow brown line and a dark spot; beyond this the broad bands run down on the sides to about one-third the distance from the ventrals, the alternating dark spots of the forepart of the trunk cease, and begin on the ventrals instead, along which there are 33, of various forms and sizes including the one on the anal region.

Tail completely encircled with 5 black bands; tip of the tail black.

Hab.—The Mekran Coast.

The present species evidently belongs to that group of Hydrophidæ classed by Dr. Gunther in his *Reptiles of British India*, as having small imbricate scales in 43 to 47 series round the neck, ventrals split into two. It, however, differs from the group in having large scales, and in the number of scales round the neck being 40 instead of 43—47, and from the only species showing these characters, viz. *Hydrophis Stokesi*, it differs in having the 4th labial and a detached shield under the eye and 33 large black blotches along the ventrals. The number of ventral shields is not given by Dr. Gunther, nor the number of black cross bands on the trunk and tail. The colouration partly agrees with the description of *H. Stokesi*, from the Northern Coasts of Australia, but the differences are sufficiently marked to separate it from any known described species.

It may be mentioned that although Dr. Gunther at the time of writing doubted the occurrence of *H. Stokesi* in the China Seas and in the East Indian Archipelago, Mr. W. T. Blanford in *P. Z. S.*, 1881, states that two specimens from Singapore examined by him must be identified with it.

HYDROPHIS PLUMBEA, Sp. nov.

Rostral 5-sided, triangular at apex and reaching the upper surface of the head. Nasal wider than high, in suture laterally with the first two upper labials. Frontal, as wide as high, rounded behind and in suture with the upper præocular and superciliary. Vertical hexagonal, subtriangular in front and tapering behind. Occipitals 5-sided, the length of each twice the greatest breadth. Temporals three on each side of each occipital, the anterior largest and nearly entering the labial margin. Upper labials 8, the 4th under the eye,

the 6th and 7th small and about one-fourth the size of the 8th. 10 lower labials. 30 series of scales round the neck. Scales of the body keeled. Ventrals 230, the 1st separated from the posterior pair of chin shields by 4 scales only. First six ventrals wider than high, and four times as wide as the adjoining scales, the rest decreasing in size from three times the size of the adjoining scales till at four-fifths the length they are scarcely larger than the adjoining series.

Colours.—Plumbeous dorsally on the upper third, with faint dark brown cross bars, of which there are 32 on the trunk and 2 on the tail. Scales above and below the tail, and on the half of its terminal length black with some white scales intermixed on the latter. Sides and abdomen white, with faint indications of the dorsal bands running down on the sides. Upper and lower labials also the rostral, mental and chin shields of a salmon colour; a faint dark streak in front of the eye, and a salmon-coloured spot on each side behind the gape.

Hab.—The Mekran Coast. Both this and the preceding (*H. guttata*) were collected by Capt. E. Bishop of the I. G. S. Patrick Stewart.

A LIST OF THE BUTTERFLIES OF THE BOMBAY PRESIDENCY IN THE SOCIETY'S COLLECTION.

WITH NOTES BY E. H. AITKEN.

(Continued from page 218, Vol. I.)

PAPILIONINE.

73. *Ornithoptera minos*.—Although there is no specimen of this butterfly in the collection on which these notes are based, I will include it here, having known three instances of its occurrence in the region with which they deal. On the 5th of June 1873, I caught a fine female in Poona and on the same date six years after I saw one at Karanja. In the interval the Rev. Dr. Fairbank had taken one, also a female, in his garden at Ahmednugger. For an insect with such powers of sustained flight a journey of a few hundred miles, with the wind, must be a small matter, and I imagine these specimens drifted from the Canarese or Malabar Coast, among the beautiful backwaters of which the species is so abundant that a Collector in Calicut told me he slew every one that came within his reach, regarding them as a nuisance. I felt sorry for the victims, but more so for their murderer.

74. *Papilio agamemnon*.—This is very common both in Bombay and the Deccan and on the hills too, and to the young collector it has a peculiar fascination. It flies fast and with a good deal of style and is rarely seen to settle. When it does alight it selects a shady spot and rests with wings closed. Sometimes on a hot day it will spend a long time flitting up and down under a shady tree as if on sentry duty. The larva feeds on the custard apple and must be sought on very fresh leaves in the shade. It rests on the upper side of the leaf, like all papilio larvae. It is the most difficult of caterpillars to rear. It will remain on a faded leaf and starve sooner than move to a fresh one and cannot be transferred without injury as it carpets the leaf with silk and hooks its feet to it. I have never succeeded in rearing one from the egg.

75. *Papilio sarpedon*.—This, the most sprightly of all our butterflies, is found only on the hills; very common there about the end of the year. It is swift, restless, very hard to catch, and when caught generally breaks its wings in the net. It is very fond of sipping the moisture from damp ground.

76. *Papilio nomius*.—I have never seen this species alive. The specimens in the Society's collection were sent by Mr. Davidson and Mr. Wroughton from Khandesh and the Ghauts which lie between the Tanna and Nasik Districts. I am told it frequents ravines and flies very swiftly.

77. *P. erithonius*.—The commonest of the genus, occurring everywhere and appearing almost throughout the year. The larva feeds on various trees of the orange tribe, but in Bombay forsakes them all for the most offensively odoriferous garden rue.

78. *P. pammen*.—This is nearly as abundant as the last, the polyctor form of the female being decidedly the most common. There seems to be nothing seasonal in the appearance of the different forms. I have reared all three from eggs laid by polyctor, in the same week. The larva feeds, like that of the last, on various species of the orange tribe, refusing others. I have never found it on the pummalo, nor on the rue, of which the last species is so fond, but a sweet lime in my garden now can scarcely keep a fresh leaf, and a small Japanese orange is sadly ravaged. Another favourite is the curry-leaf—*Bergera koenigii*—on which I have never found the larva of the last species. The pupa is green when it forms in the midst of green leaves and brown when attached to the trunk of a

tree. In neutral circumstances the colour seems to be optional! I have seen a green and a brown pupa on the same pane of glass.

79. *P. polymnestor*.—I do not understand the distribution of this butterfly. It is absolutely unknown in Bombay and I imagine throughout the Konkan, but becomes one of the most familiar objects as soon as we reach a level of 2,000 feet. I do not think it occurs in the Deccan generally, but in Poona it frequents the old gardens in the city. Again it abounds all along the Malabar Coast at the level of the sea. Its chief season appears to be the latter half of the monsoon, but a good many come out in March and some may be met with all through the hot months. The larva feeds on lime and orange.

80. *P. helenus*.—I found this not uncommon at Mahabaleshwar last March, but have never met with it elsewhere. I know it occurs occasionally at Khaudalla. This and the last two species have the habit of going regularly round a certain circuit, so that by taking one's stand at a spot where it has passed once one is pretty sure to meet it again every half hour or so.

81. *P. dissimilis*.—This is either very rare in the Presidency or passes so easily for *Danaus limniace* that it escapes notice, but last year in November and again in February I found a good many larvae on a tree near my house which proved to be *Tetrantheris apetala*, rather an uncommon tree in Bombay. The larva grows to a very large size, but just before becoming a pupa it voids a transparent membrane, like a bladder filled with air, which reduces it considerably. One end of this is attached by a fine black cord to the surface on which the larva rests and the other merges in a large gathering of excrement. The pupa is a much more remarkable example of mimicry than the perfect insect. Its resemblance to a withered twig broken off short being perfect in every detail. Distant in his magnificent work quotes more than one authority to the effect that the flight of this butterfly is very strong. My observation does not confirm this. On the contrary I have been more than once struck with the degree to which its mimicry of *D. limniace* was supported by the similarity of its lazy flight and attitude.

82. *P. clytia*.—Among the larvae of the last species, which I reared, was one, not distinguishable from the rest, which to my astonishment turned into this. I am quite satisfied that the two are one species. I have never recognised another specimen of

panope in this Presidency, but have little doubt that I have often let it pass for *E. core*.

83. *P. diphilus*.—This species is not rare in Bombay, but has its home on the Deccan plains, where throughout the cold season one finds every babool tree, early in the morning, decorated with hundreds of them torpid with cold. They always rest with wings expanded. The larva feeds on *Aristolochia bracteata*, a common weed in black soil. The flight of this species, like that of most protected butterflies, is notably feeble.

84. *P. hector*.—I have found this in Poona, Bombay and the Islands of the Bombay harbour, but it is rather a scarce butterfly in this Presidency. It seems to be much commoner some years than others.

PIERINÆ.

85. *Hebomoia glaucippe*.—I have never seen this at Poona, nor in open country anywhere, but in hilly country it occurs down to the level of the sea. One specimen in the collection was caught on Malabar Hill in Bombay, and it is not uncommon across the harbour. On the Ghauts it is very abundant in March and perhaps throughout the cold season. It flies very fast, but often stops at a flower, resting, like the next four or five species, with its wings half open and drooping.

86. *Ixias mariamne*.—This occurs every where and at all seasons, frequenting hedges and small jungle. It is equally abundant on the hills and on the plains.

87. *I. pyrene*.—Perhaps not quite so plentiful as the last, but equally ubiquitous. I believe in only two species of *Ixias* in this Presidency. Those who describe under a new name every specimen in which their practised eyes detect some minute diversity in the position of a spot or the breadth of a margin, seem to me to assume an invariability of specific coloration which has no parallel elsewhere in the animal kingdom, and the argument that the varieties so described are *constant* loses all force to the plain man's mind when he finds that one expert rejects half the species founded, or accepted, by another.

88. *Teracolus danaö*. This species seems to require a dry climate. I have found it pretty common in Berar and Cutch and it occurs in Poona, but not ordinarily in the Konkan, though Col. Swinhoe took it in Bombay during the famine year.

89. *T. etrida*. I have not yet seen any reason to believe that

all the orange-tipped *teracoli* in this Presidency constitute more than one species. It is subject, like most of the *pierinæ*, to very wide variation, which does not seem to depend much on climate or season. I have reared very different varieties from larvæ taken at one time in the same spot, if not on the same plant. The larva feeds on a small climbing caper which is very common on the hilly parts of Bombay. (Young plant of *C. horrida*?) It is nearly cylindrical, slender and of a uniform green colour, with the rough surface characteristic of the larvæ of *Catopsilia* and *Terias*. The pupa has a sharp transverse ridge above, at the junction of the thorax and abdomen, which extends well beyond the general outline on each side, forming a pointed lateral process. From this a dorsal ridge runs out into a similar point just over and behind the head. The colour is light green, with a triangular patch of yellowish white on the anterior side of each lateral process and a similar patch covering the top of the head. This species is in season at the commencement of the hot weather.

90. *T. cypræa*. This occurs sparingly in Bombay, but is common in May and again at the close of the year among the salt works on the mainland across the harbour, where I have found the larva in November and December feeding on a tree, called by the natives *Sairi*, fond of briny situations. I have persecuted the Botanical Section for its name without success.* It is slender, cylindrical and rough on the upper surface like the larva of *Terisa*. On examination with a strong lens this roughness proves to be due to minute tubercles, out of each of which grows a short black bristle. Each side, above the base of the legs, is fringed with somewhat longer white hairs. The colour is grass green above, with a dark blue dorsal line very narrowly bordered with yellow. The under side is a paler bottle green, a lateral yellowish line separating the two tints. The pupa is very similar in form to that of *Terias* and of a dingy whitey-brown colour. The aspect of this pupa confirms my general impression that this species is much nearer to *Terias* than to some of the species with which it has been lumped under the name *Teracolus*.

91. *T. dynamene*. Mr. Newnham sent a number of these from Bhooj, and I found it common at Kharaghora on the borders of the Runn of Cutch in the hot season.

* *Avicennia tomentosa*—A white-flowered variety of Mangrove.—K. B. KIRTIKAR, Botanical Secretary.

92. *T. puellaris*. I found this also at Kharaghora in company with the last. They were always flitting about the wild caper (*C. aphylla*) which formed the most prominent feature of the vegetation in that wilderness, and I have no doubt now that they were laying their eggs on it.

93. *T. protractus*. For our specimens of this we are indebted to Mr. Newnham at Bhooj.

94. *T. fausta*. I found this at Kharaghora in the rainy season. We have it from Bhooj too. This and the last three are purely desert insects and are out of place in this collection; but the few butterflies we have from Cutch have been temporarily included in the collection representing Bombay and the Deccan.

95. *T. fulvia*. } There is one specimen of each without
96. *T. tripunctata*. } note of locality.

97. *Appias libythea*. This is very common in Bombay about the beginning of the hot season, that is to say in "spring." I have found the larvæ in April on more than one common plant of the caper tribe. It is at first sight like that of *T. ctrida*, but the anal extremity tapers slightly and ends in a bifid projection. The pupa is exactly like that of *T. ctrida* in form, but different in colour, being pale watery green with numerous dark spots.

98. *Beleuois mesentina*. This is pretty common everywhere, and long ago I found the larvæ of it on a plant which from my recollection of it must have been *Calaba indica*. Capers are evidently wholesome to the pierine constitution. Unfortunately I kept no notes then, but I recollect the larva as clothed sparingly with soft hair, like that of *D. eucharis*.

99. *Huphina phryne*. This is another species which from my point of view has been most needlessly split up. It is one of the few species of which it may with truth be said that it is in season all the year round. It is as common on the hills as on the plains.

100. *Delias eucharis*.—This is common all the year except during the mouths of heavy rain. It rises early in the morning and flies high, but not fast. The larva feeds on the common mistletoe, *Loranthus longiflorus*, which grows on mango and most other trees everywhere. Unlike nearly all other butterflies and like moths, this species lays its eggs not singly, but together, in regular rows. The larvæ are gregarious when young and soon clear a small *Loranthus* of its leaves, and the habit which they have of letting themselves down by their silk when disturbed is no doubt

connected with the necessity so often imposed on them of travelling in search of fresh pastures. I do not think birds eat them, but they are the victims of a dipterous parasite, in appearance not unlike a house fly. Immediately after the caterpillar has become a pupa, the larvæ of the parasite, of which there may be half a dozen, undergo the same change within its shell and the beautiful bright yellow pupa at once turns black.

101. *Nepheronia gaea*.—This is very common in Bombay at the close of the monsoon and for some time after. It frequents lanes and hedges, especially where there is water and plenty of verdure.

102. *Pontia xiphia*.—This comes out about the close of the rainy season and continues all through the cold months. About shady lanes and hedges it is sometimes very abundant, flying low and settling constantly. I think it occurs throughout the Presidency, wherever there is sufficient moisture and vegetation.

103. *Catopsilia*.—This perplexing genus is poorly represented in the collection, and I must annotate on it as a whole, never having been able to form an opinion for myself as to how many distinct species there really are (I mean in nature, not in museums). *Pyranthe* keeps itself quite distinct, laying its eggs on a small annual shrub (*Cassia occidentalis*); but the larger species fly high and fast, are indistinguishable on the wing and appear to feed indiscriminately on several leguminous trees, and as the larvæ resemble each other strongly, it is almost impossible to settle anything by breeding unless one could induce the insect to lay its eggs in captivity, which I fancy would be difficult.

This genus differs from all the preceding in one point of attitude, namely that, when at rest, it sits upright with wings firmly closed. The habit of migrating westwards has often been noticed. I have observed these migrations in September, and always I think in the face of a strong west wind.

104. *Terias lacta*.—This species, though by no means so abundant as the next, is common enough about Bombay at the end of the rainy season and for some time after. It varies little compared with the next.

105. *T. hecabe*.—Till some one arises with leisure and ability to rescue this genus from the chaos into which it has been plunged by reckless species-making, everything which is not *lacta* must go as *hecabe*. I am disposed from my own observation to believe in a third species, smaller and more dusky than *hecabe*, which swarms

about grassy plains during the monsoon, laying its eggs on a minute leguminous weed among the grass. *Hecabe* proper feeds on several leguminous plants, but seems to forsake all else for *Sesbania aculeata*, already mentioned as the food of *Tarucus plinius*.

HESPERIIDÆ.

The *Hesperiidæ* seem to me to be very much over classified. Nothing is gained by dividing a group of butterflies so much alike in all stages of their existence into such a multitude of genera, and I very much doubt whether it will not be found necessary, as our knowledge of their life history advances, to re-arrange the whole family, dividing some of the present genera and uniting others.

106. *Gangara thyrsis*.—I do not think I have met with this species out of Bombay, and there it is capriciously distributed, being common in some gardens and absent from others. It comes out before dawn and after sunset, and is always at flowers, particularly those of lilies.

107. *Pratapa alexis*.—This species is very abundant in the country surrounding Bombay during the rains. I have found it also in fields of lucerne grass in Poona during the hot weather in company with the next. It feeds chiefly in the morning. As the stout thorax indicates, it is one of the strongest of butterflies on the wing.

108. *Badumia exclamationis*.—This is common everywhere while the rain lasts, swarming about *duranta* and other plants with small flowers, especially in the early morning. When crossing the Bombay harbour about the month of September one meets hundreds of *hesperiidæ* flying over the sea, this being one of the most plentiful.

109. *Parnara naroda*.—I know little about this. We have two specimens.

P. bada.—We have only one specimen.

110. *C. mathias*.—This is about the commonest of the family during the rains. The larva feeds on a common grass, stitching the edges of a leaf together so as to form a tube, in which it lives, coming out to feed at night. It passes the pupa state in the same shelter.

111. *C. agna*.—I believe I have bred this on rice. The larvæ has the same habit as the last.

112. *Suastus gremius*.—This is not uncommon in Bombay and Poona, being very similar in habits to the last two.

113. *Isoteinon nilgiriana*.—The specimens in the collection were contributed by Mr. Wroughton, I believe, from the Tanna District. I know nothing about it.

114. *Telicota augias*.—We have one specimen only, caught by Mr. Wroughton at Nasik.

115. *Padraona dara*.—The same gentleman contributed this species from the Nasik District.

116. *Astictopterus salsala*.—There are a few specimens of this, without note of locality. I have found it in Bombay.

117. *Taractrocera ceramas*.—I got a few specimens of this at Egutpoora in October.

118. *Ampittia coras*.—This is not rare anywhere during the monsoon, but difficult to see and more difficult to keep sight of, as it flies fast, but very low, and alights on the ground.

119. *Udaspes folus*.—This is chiefly a hill species, very common on the ghauts in shady lanes early in the morning.

120. *Pyrgus galba*.—There are specimens in the collection from the Tanna District and also from Cutch, the former being conspicuously larger and darker than the latter. I have never met with it.

121. *Abaratha ransonettii*.—We have only one specimen, which I caught at Egutpoora in October 1885.

122. *A. Tissa*.—Our two specimens of this were caught by Mr. Wroughton at Bansda between the Surat and Tanna districts.

123. *Pterygospidea angulata*.—I saw two on three specimens of this at Mahabaleshwar last March and caught one. They were flying about at noon and resting on flowers with wings expanded.

124. *Plesioneura ambaresa*.—This comes out in March and in suitable situations is very abundant. I have found it in Bombay, on Karanja Island and at all the hill stations. It is quite a moth in its habits, taking shelter during the day in the house and flying by night.

125. *P. Alysos*.—I caught a single specimen of this at Mahabaleshwar last March. It has no business to be in the same genus as the last. It closes its wings when at rest.

126. *Sarangesa purendra*.—This is a miniature of *P. ambaresa* in all respects. Like that species it frequents rocky places and when resting on a stone is difficult to detect. It is to be found almost everywhere.

127. *S. Dasahapa*.—Mr. Wroughton took two specimens of this at Bassein in the Tanna District.

In concluding these very superficial notes I must acknowledge my indebtedness to Mr. L. de Nicéville and also to Colonel C. Swinhoe for that assistance in naming specimens without which a mere collector like myself could not have proceeded many steps.

NOTES ON "THE WATERS OF WESTERN INDIA."

BY MR. J. D. INVERARITY.

The interesting article on the above subject by KESWAL in the October number of the Society's Journal induces me to send you a few rough notes taken from my journal which I think will prove that some of the birds mentioned by KESWAL as not occurring in the Konkan are to be found there.

The Indian Golden Plover.—This bird, I should say, is fairly common about the salt lands and rice fields bordering the numerous creeks that run up from the Bombay Harbour. The first I remember seeing, were on the Bombay flats in October 1877. I saw three and shot a couple on the site of the present race-course. In a subsequent year, I think March 1883, I saw a flock of about a dozen close to the race-course one evening when I was riding. I approached quite close to them two or three times, and have no doubt they were *golden plovers*. I have also shot them as follows:—February 1878, 4½ couple near Panwell; December 1878, 1½ couple on the Tanna creek; November 1880, 2 couple near Tullooja; February 1881, 2½ couple near Panwell; February 1884, 1 couple near Panwell; November 1886, 2 couple near Penn. In fact, I may say, I have seen some every year I have been shooting. I was at home in the cold weather of 1879-80, 1882-83 and 1884-85, which accounts for my having no note of them in those seasons.

The Bittern.—The large true bittern I have shot several times, though in some years they don't put in an appearance. In October 1877 I shot one on the Bombay flats close to the site of the present James Greaves Spinning Mill; January 1878, saw one on the Bhewndy Tank; February 1878, shot one at Panwell; February 1881, one shot at Panwell; November 1883, two shot at Tullooja; December 1883, two shot at Deo near Panwell; February 1884,

one shot at Panwell. I have seen two or three others besides of which I have no note as to dates.

The Chesnut Bittern (Ardetta cinnamomea)—is fairly common. I have seen several, but have seldom fired at them. I have shot them at Gorebunder, and shot one near Penn on November 28th, 1886.

The Stone Plover (Bastard Florican).—Rare. I have only shot one at Panwell and don't remember having seen another.

The black-tailed Godwit.—I have only once seen one, a solitary bird. I shot it in February 1884 among the salt pans at Penn.

The Avocet—does not occur, I think, about the Bombay Harbour. I have seen several and shot a few in the creeks near Udware and Billimoria.

The Purple Coot.—Large numbers are to be found on the Bhewndy Tank. I saw three and shot one on the Vehar Lake.

The Bald Coot.—Quite common, large flocks on the Bhewndy Tank, Panwell Tank, Vehar Lake, on several small tanks near Callian, Panwell, Penn. Bald coots are always to be found in the cold weather; not having visited them at other times of the year, I can't say if they remain there.

Rails and Crakes.—A large variety are to be found in the paddy fields across the harbour before the rice is cut. I am unable to particularize them as I have seldom fired at them. The spotted crake (*Porzana Maructta*), I know, is pretty common; I have shot it occasionally.

Curlew.—I saw a curlew on the Bombay race-course on September 26th, 1886.

The Cotton Teal.—This duck certainly bred this year in the paddy fields near Indune. I shot several, some of them young birds, of this year on November 3rd, and also saw a young one alive, unable to fly, in the possession of a villager who had caught it.

The Nukta.—A young bird of this year was shot by Mr. Leslie Crawford in my presence on a small tank not far from Penn on November 28th. It was a solitary one. I have not seen the nukta here before. On the same tank, at the same time, I shot a tufted pochard, also a solitary one. I sent the latter to the Society. It had a bright golden eye, so I am sure it was the tufted pochard. Mr. Aitken at first thought it was a white-eyed pochard.

The Scaup Duck.—I shot a female on a small tank near Panwell on January 13th, 1884. I believe this is the only instance of a scaup

duck being shot in the Bombay Presidency, though I believe a few have been procured at Kurachee

The following ducks have all been shot by me about Bombay:—

The whistling teal, the shoveller, the gadwall, the common teal, the garganey teal, the pochard or dun bird, the white-eyed pochard, to which list may be added the nukta, the tufted pochard and the scaup mentioned above. The shell drake, the Brahminy, the mallard, the spot-billed duck, the pintail and the wigeon, I have not come across near Bombay.

The whistling teal and cotton teal, I think, breed in some tanks a few miles from Narel; at least I have seen large numbers there.

The pheasant-tailed Jacana.—I have seen numbers of these birds on the tanks at Callian.

The Woodcock.—One was shot near Tanna in 1878. I saw the skin. (See *Stray Feathers*, Vol. 7, p. 525.)

I hope that other members of the Society, who have more time at their disposal than I have, will send to the Society's Journal anything worth recording that they may have observed.

SOME FURTHER NOTES ON ABNORMAL HORNS.

BY THE EDITOR.

One of the most interesting cases of abnormality that has come before me lately is that of a doe-antelope, *A. bezoartica*, of which I give an illustration. The females of this species, as in the case of most of the *Cervidæ* and *Antelopinæ*, are hornless, but this specimen exhibits a pair of very symmetrical horns, ringed, but not spiral, situated on well-formed bony cores and diverging outwards, downwards, and forwards like those of a wild sheep. The horns are thin, about 1 inch in diameter, and about 22 inches in length. They belong unmistakeably to a doe, and not to a young male. The skin has well-defined traces of the mammæ. The animal was shot by native shikaris, and the head and skin, which are the property of H. H. the Maharajah of Jodhpore, were sent here for inspection. It is to be regretted that we had not the creature in the flesh, for dissection would probably have shown abnormal conditions, either hermaphroditism or ovarian disease. In the Linn. Transactions, Vol. II., it is recorded that a female doe with a single horn resembling that of a three-year old buck, was found on dissection to have the ovary of the same side scirrhus. An interesting

fact regarding the production of malformed horns has recently been brought to my notice by Dr. A. Barry, at present Superintendent of Matheran. It bears on the probable influence that certain injuries may exert on the growth of antlers. We know that a common operation will stop the growth in the young male, or cause a deteriorated horn in the adult, which remains permanent, and is not shed annually. Dr. Barry had a tame Cheetal stag, with fine horns of normal shape. He had a severe accident, breaking one of his *hind* legs; the following and successive years the antler on the side opposite to his injured leg was deformed. Now against this I bring forward a case of another Cheetal stag in the Kurrachee Gardens. This creature jumped out of a window, and broke one of his *fore* legs, the injury had no effect whatever on his horns. In Dr. Barry's stag the injury was probably communicated sympathetically to the internal organs, and such cases may be more frequent in the jungles than we imagine, and so lead to the numerous examples we have collected of abnormal antlers. I have figured on stone, from water colour sketches by Major G. R. R. Poole, of the 12th Lancers, two very curious Sambar horns, very massive and large, which he saw hung up in the outer Court of the Jeypore Museum. He wrote—"The thick ten-pointed one is a Sambar, without doubt, the other eight-pointed one is, I believe, a Sambar. I know the Kashmir stag well, and do not think it was one. The heads were hung so high that I could not get at them, but should say the massive one was about 40 inches, or getting on for it. The other seemed two or three inches longer." It is doubtful whether the latter is not an immature horn of *Cervus Cashmirianus*, but I am inclined to think not from its size. If, therefore, it be a Sambar, it shows a curious progression from the Rusine to the Cervine or Elaphine type, the bez-tines being of perfectly normal shape and size it only requires the addition of a tres-tine to make it an Elaphine antler. I have written to enquire further about these horns.

R. A. S.

NEW SPECIES OF FISH FROM KURRACHEE AND THE PERSIAN GULF.

BY JAMES A. MURRAY, LATE CURATOR OF THE KURACHEE MUSEUM.

SALARIAS PULCHER—*Sp. nov.*

HEAD vertically rounded in front with a pair of inter-orbital tentacles, none on the nape; eyes placed forward, the orbital ridge

in front projecting, and the inter-orbital space above the tentacles concave. No crest on the head. The maxilla reaches to below the middle of the eye. No canines. Dorsal fin divided by a notch and with $1\frac{3}{9}$ spines and rays, not continuous with the caudal; 8th to 11th spines of first dorsal with free rays projecting beyond the membrane. Anal fin with 20 rays; caudal with free rays. Head $\frac{1}{7}$ th of the total length; height of body a little more than $\frac{1}{4}$ th. Pectoral laid forward reaches a little beyond the hind edge of the eye.

Colors.—Anterior two-thirds chocolate brown; posterior third golden yellow, with 5—7 vertical dark bars. Caudal pale yellow slightly edged with brown. Dorsal fin with a dark spot on the upper edge between the 1st and 2nd spines; a second also on the upper edge between the 2nd and 3rd spines. A third ovate spot mesially between the 5th and 6th spines; a fourth at base of 7th spine; a fifth on the upper edge enveloping the 7th and 8th spines, a sixth also on the upper edge enveloping the 9th, 10th, and 11th spines. Base of 1st dorsal brown; 2nd dorsal unmarked; pectoral pale yellow; anal white anteriorly and pale yellow posteriorly; slightly bordered with brown.

A second specimen agrees with the above description in every particular, except that there is only a spot between the 2nd and 3rd spines, and another on the 7th and 8th spines, the others being absent, owing probably to age.

Hab.—Kurrachee, Manora.

SALARIAS OPERCULARIS—*Sp. nov.*

D. $\frac{12}{16-17}$; Anal 18-19.

The highest part of the body equals the distance between the snout and hind margin of the branchiostegals, and is $4\frac{1}{2}$ to $4\frac{3}{4}$ times in the total length. The forehead does not project in line with the snout. A pair of simple tentacles at the nostril, another above the orbit. A curved canine on each side of the lower jaw behind the series of small teeth. Inter-orbital space concave, its width less than the diameter of the eye; the maxilla extends to below the middle of the eye. Dorsal fin notched and not continuous with the caudal, both portions of nearly equal height. Anal fin not as high as the body.

Colors.—Body pale fleshy with seven vertical brown bands extending to the upper edge of the dorsal; 1st dorsal with a dark spot on the upper edge between the 1st and 2nd spines. Anal rays ciliated

and narrowly edged with brown. A dark patch on the opercle and an oblique streak below it behind the maxilla, and another vertical one immediately below the middle of the eye.

In the adolescent and young these streaks are continued to below the chin, and in the interspace between these two lines are two subtriangular dark spots.

Hab.—Kurrachee (Manora rocks).

PSEUDOCHROMES PERSICUS—*Sp. nov.*

B. 5 D. $\frac{3}{5}$; Vent $\frac{1}{5}$; Pect. 18; L.l. $\frac{5}{10}$, not continuous; Anal $\frac{8}{19}$; L. T. 15. The height of the body equals the distance between the snout and the extreme hind edge of the preopercle, and is $4\frac{1}{2}$ times in the total length.

Length of snout equal to the diameter of the eye. Opercles scaly. Dorsal and anal fins produced posteriorly and pointed. All the rays of the anal, pectoral, ventral, caudal and the posterior rays of the dorsal branched; caudal fin covered with scales for one-half its length.

Colors.—Pale fleshy on the body. Head and snout brown, two longitudinal pale bluish white lines on the preopercle; a black spot behind the opercle with a vertical bluish white line through it, in its anterior third. Body covered with scattered blue spots. Dorsal, anal, and caudal fins with faint blue spots, not unlike broken up undulating lines. The young has a dark brown line running from the snout through the eye to the end of the dorsal fin, which disappears with age.

Hab.—The Persian Gulf. I am indebted to Captain Bishop, of the I. G. S. Patrick Stewart, for specimens of this fish, which were collected by him in the Persian Gulf, when repairing the Indo-European Telegraph cable.

DESCRIPTION OF A NEW LIZARD FROM THE DANGS.

By F. GLEADOW.

HEMIDACTYLUS MURRAYI, *Sp. nov.*

Digits quite free; free distal joints of digits long; dorsal tubercles strongly keeled; not more than 8 lamellæ under the inner toe and 11 under the median toe; 5 (4—6) lamellæ under the inner, and 8 (7—9) under the median toe. Tubercles in 16—20 (14—22) longitudinal series.

Males with 6—8 femoral pores on each side.

Snout longer than distance between eye and ear opening, about $1\frac{1}{4}$ the diameter of orbit. Forehead concave. Ear opening oblique, less than half the diameter of the eye. Digits moderately dilated, the inner well developed. Rostral grooved, slightly broader than high. Upper labials 10—12. Lower labials 9—10. Nostril between the rostral, first labial, and three small tubercles similar to those on the muzzle. Back of head, and between eye and ear-opening, granular, with scattered conical or rounded tubercles. Eyelid distinct, granular. Pupil vertical. Chin-shields two pair, the first largest and in contact with the triangular mental and first labials. Second pair smaller opposite the second labials, reaching their posterior suture, but sometimes touching the first labials. Mental broader than the rostral. A row of decidedly enlarged scales along the lower labials, followed interiorly by others diminishing in size. Chin and throat with small granular scales. Upper labials bordered by a distinct row of tubercles slightly longer than those on the muzzle. Tubercles on the muzzle closely packed, smallest in front of the eye. Scales across middle of abdomen in 32—36 rows, each scale minutely 3—10 dotted. Back covered with granular scales interspersed with 16—20 (14—22) rows of keeled trihedral tubercles more conical on the flanks, and all less than half the diameter of the ear-opening in size. Limbs with scattered keeled tubercles. Tail longer than head and body, verticillate, grooved medially above, as far as 10 or more verticels. The first few verticels with 3—4 sharp conical keeled tubercles on each side, decreasing in number and size towards the tip. Sub-caudals enlarged, about 50—60 in number to tip of tail. Femoral pores 6—8 on each side, interrupted in the middle. The foreleg laid forward reaches nearly the nostril. Inner toe with 5 (4—6) lamellæ below. Median toe with 8 (7—9) lamellæ.

Color grey, with several dark bands across the back, the bands shaped somewhat like two crescents back to back, thus \smile . Markings frequently variable or indistinct. A dark streak from nostril to eye, with three others diverging behind the orbit, the upper one sometimes produced over the shoulder; underparts white; tail banded.

Length—Head and body 65 mm. ($2\frac{3}{4}$ in), tail 75 mm. (3 in).

The above description is taken from 24 specimens, 8 males and 16 females, forming a nearly pure gathering from two localities, Pimpri and Garvi, in the "Dangs," a forest and mountainous region of

about 1,000 sq. miles, with a rainfall of about 100 inches, at the north-west extremity of the Syhadri or Ghat range, between Khandesh and Surat. The animal inhabits both trees and houses, living under loose bark, and in nooks and crannies. Its habits are chiefly nocturnal, though it may be caught in the day time. I believe I have it also from the town of Surat, but this locality requires confirmation.

I desire to name this new species after Mr. J. A. Murray, to whom I am indebted for a great deal of willing assistance during the past.

ZOOLOGICAL NOTES.

DELPHINUS LENTIGINOSUS. I have received a letter from Mr. Sinclair announcing the capture of a fine Delphinus on the Alibag Coast, which apparently is *lentiginosus*, and if so it is a very fine specimen, the skin of which is an acquisition to our Museum. The average length of this species is from seven to eight feet. I give Mr. Sinclair's careful measurements and description:—

| | |
|---|--------|
| Adult Male—Length between standards | 10' 6" |
| * Greatest height exclusive of dorsal fin | 1' 5" |
| Greatest circumference of pectoral region exclusive of fins | 4' 3" |
| Height of dorsal fin | 8" |
| Base length of dorsal, true horizontal | 2' 3" |
| Extreme length of flipper, from front of axilla to tip | 1' 3" |
| Greatest depth of fluke parallel to spine | 9" |
| Greatest expanse of flukes | 2' 3" |

(Note that this is identical with base length of dorsal fin.)

Length of rostrum (restricted) 8". Spiracle single, fairly large, crescentic. A vertical line drawn through its posterior angles would cut the anterior angles of the eyes. Teeth numerous in both jaws, conical, not yet counted.

The shape is that of the genus; the caudal region is very much compressed, and its inferior and superior surfaces produced into what might be called rudimentary anal and dorsal fins.

Colour—Above (and below behind the anus) rather pale leaden gray, with numerous long drop-shaped spots. Of these the majority, especially on the rostrum, limbs, dorsal fin, and flukes, are pure white, the rest dark slate color or black.

Below, from the anus forward the general ground colour is white, much mottled on the belly with the dorsal ground colour, less so on the breast, and the ventral region almost pure white; but there are a few black spots.

* This of course would be much greater in the water, the weight of the animal in shore depressing the anterior parts.

Contents of stomach a few small crustacea.

The specimen was caught in a drift net in the offing of Alibag.

The dental formula which he sent me in a subsequent letter gives $\frac{36}{32} - \frac{36}{32}$.

The specimens reported on by Professor Owen had $\frac{32}{32} - \frac{32}{32} = 129$, which differs somewhat, but I find that much stress must not be laid on the teeth in Dolphins. *Delphinus gadamu* varies in individuals from 96 to 108 teeth.

R. A. STERNDALE.

NEST AND EGGS OF *CINNYRIS LOTENIA*.

As far as I know there is nothing on record about the breeding of this sunbird, and since I went to Uran on the so-called Island of Karanja, where the bird is not uncommon, I have been on the watch for its nest. It is a permanent resident, frequenting the sides of the hills, and incessantly uttering the loud cheery note which serves at once to distinguish it from the other members of its family. It seems fonder of flowers than either *asiatica* or *zeylonica*, and often hovers over them like a hawkmoth, inserting its long tongue.

In October I suspected strongly that a pair had a nest somewhere in a well-wooded slope close to my house, but I did not succeed in finding it. Later on I saw a pair followed by two young ones, and my heart sank within me. But the birds themselves came to the aid of science, and, about the beginning of November, made a beautiful nest in the middle of a small tree close to my verandah. I had to watch it carefully, for there was a pair of *zeylonica* in the garden. However, the birds were not shy, and I soon had abundance of opportunity of assuring myself about the ownership of the nest. As I frequently saw the female going in and out, I concluded the eggs were not yet laid; so I waited a week and then one morning I went cautiously up and touched the nest with a long stick. In a moment the bird darted out and flew round and round me, screaming and calling all the birds of the neighbourhood together. It is one of my rules not to take nests in my own garden, but on this occasion I thought the rule would be more honoured in the breach than the observance; so I mounted a chair and cut the nest down. What was my horror on discovering that it contained one egg and one young one, just hatched. I plunged the other egg at once into cold water, and left it in it for five minutes in order to kill the chick, if there should be one. Alas! next evening, thirty-six hours after, this egg too was broken, and a little naked thing was struggling to get out. I have therefore only the broken shell of one egg and the nest for my spoil. The nest, as you see, is remarkably long, measuring fully ten inches. Otherwise it is very similar to that of *zeylonica*, having the entrance near the top, protected by a portico. It is constructed of fine fibres and grass, and covered all over with small pieces of bark and other rubbish, chiefly that favourite material with all sunbirds, the woody refuse with which wood-boring caterpillars cover the entrances of their holes.

The egg is not an ornamental one. The ground colour is a dirty brownish white, the smaller end being thickly covered with dull brown spots, which pass into larger confluent blotches and form a cap on the other end.

E. H. AITKEN.

THE CAT AND THE SQUIRREL—A FOSTER-MATERNAL FREAK.

We have all heard of Romulus and Remus being suckled by a she-wolf and similar, and perhaps better authenticated, stories. But until a few days ago I never had the chance to see a cat nursing a squirrel.

First I must tell the adventures of the cat, the heroine of the tale. One evening, when dressing for dinner, I threw a garment into my dirty clothes basket. Out bounced a cat to my great surprise and temporary discomfiture. Hearing faint squeaks from the basket I looked in and saw three little kittens snugly nestled in the folds of crumpled shirts and other things. The outraged mother, a cat of decent appearance, with perhaps a dash of Persian blood in her, had belonged to a friend next door, but on his departure, had been left behind, as cats too frequently are, to become a homeless vagabond. Though keenly sympathising with the cat and her troubles, it was out of the question that she should be allowed to make my clothes basket a lying-in hospital. Her feelings towards me were no doubt similar to those entertained by Calverley's cat towards the pot boy who

“Peep'd with a scared wan face ;

Then sent a random brick-bat down which knocked her into space.

Had I, as some cats have, nine tails, how gladly would I lick

The hand and person generally, of him who heaved that brick.”

However I did not heave a brick at her. I only had the kittens firmly but tenderly ejected, and sent off to the back premises of the next house, where the cat was supposed to have her domicile. But the cat had National League ideas, and was not going to submit tamely to eviction. On my returning from dining out, there she was again with all her family complete in my clothes basket. The process of eviction was then repeated, the kittens deposited as before in the verandah of the cook-room next door. To make re-entry impossible, I put the lid on the basket, shut the door and window of my dressing-room, and went to bed. I certainly thought I had got rid of the family this time. But the old cat was not to be done so easily. “Give up? give up, be blowed,” said she. Next morning cat and kittens were found calmly established on a pile of magazines on a book shelf in my office. Summary eviction was again necessary, but this time my wife interceded, and accommodated the family with a box in the verandah close by; there a few hours afterwards one kitten died, and a fourth was born and took its place.

Why the cat had such strong opinions as to the propriety of bringing up her vagabond progeny in my house I can't conceive. We had never taken the slightest notice of her, and her appearance, before this episode occurred, would certainly have resulted in her being introduced to a couple of fox-terriers, whose manners, in the presence of cats, are more forcible than polite.

Now comes the squirrel part of the story. On the day following the installation of the cat in the box in the verandah, my wife found a tiny baby squirrel (*Sciurus palmarum*) clinging to a creeper in the porch. It had no doubt tumbled out of its nest somewhere in the caves. It looked the picture of misery, shivering and woe-begone. Happy thought! Put the little waif in with the kittens. As the old lady was out on the rampart at the time, no sooner said than done.

Whether the cat would welcome the intruder seemed very doubtful, and until her return the fate of the foundling trembled in the balance. The cat *might* say—

“They call me cruel. Do I know if mouse or squirrel feels?”

“I only know they make me light and salutory meals.

“And if, as ’tis my nature to, ere I devour I tease ’em.

“Why should a low-bred gardener’s boy pursue me with a besom?”

Our suspicions of what the cat might say or do was groundless. An hour later the foundling was seen comfortably sucking the cat, going shares with the kittens, and holding its own, as if the whole place belonged to it. The cat was purring contentedly and seemed to think it all right. Four whole days have passed since the foundling made acquaintance with the *Amah*, and it appears to be sleek and thriving. It certainly gets its fair share of the cat’s attentions, and although not a quarter the weight of its foster brothers, is much too ’cute and active to be crowded out at meal time.

The cat has made one attempt since this addition to her family cares, to regain her old stronghold, the clothes basket. She deposited one of her kittens on the floor close by the basket. She couldn’t get in as the lid was shut, but she left the kitten down below it, as a last mute appeal to our good feelings. But we were obdurate, and replaced the kitten in the box. At present she appears outwardly satisfied, but I have no doubt she’ll try it on again, if ever she finds the cover off the basket.

G. VIDAL.

Poona, 21st October 1886.

Editor’s Note.—Mr. Vidal in a subsequent letter informed me that the interesting family had come to an untimely end, owing to his dogs having discovered the box.

R. A. S.

NOTES ON THE HABITS OF *NEPITA CONFERTA*.

Among all orders of insects are found many very interesting habits with relation to self-preservation. The insect in question is a small moth of the family Lithasudæ.

Having lately bred several specimens, I was much struck with the manner of preserving the chrysalis from the attacks of ants. The larva of *Nepita Conferta* is a small hairy caterpillar of a dull brown colour, having a creamy mark on the 3rd and 4th segments. It feeds on mosses, and may be found on the walls of almost any house where a damp spot encourages their growth.

When full grown the larva ascends the wall, and in a very prominent position makes a slight web interspersed with its own hairs.

The change from larva to pupa takes place within this web. Now a chrysalis which was merely enclosed in so slight a protection would soon be destroyed by the numerous ants, who are ever on the prowl. To guard against this evil, before making the light web, the larva encloses a small space with a wall of hair

This wall is constructed in the following manner:—

The hairs are placed on one end, with the other end pointing outwards, one hair having been placed, and made fast to the wall of the house, another is placed

crossing it, also having its end pointing outwards. In this way the insect continues until a space is enclosed by the wall thus made, any body who may be incautious enough to touch this wall of hairs with their hands will repent, for the hairs having fine sharp points at once enter the skin, and becoming detached from the wall remain in the skin causing an intolerable itch with great swelling.

I had a box with one of these cocoons in it, which was tightly closed and placed in an inner room. On going into this room one day, I was surprised to find a great many *confertas* busily flying round the closed box; on opening it, to find out the cause, I found my moth had just come out a perfect female; all those flying in the room were males.

Apart from the extraordinary fact of the males having found out that there was a female there, their mode of ingress was curious, as to get into the room they had first to pass through a doorway opposite which a chick was suspended, they had then to cross the outer room and go through another doorway before they were in the room which contained the prisoner. I made good use of this habit by leaving her where she was and selecting the best specimens of males in the room.

This habit of finding out and coming to a female in captivity is even more strongly developed in one of our English moths, which is commonly known as the Oak Egger.

On one occasion in a single day I captured over thirty male Oak Eggers with one female, and have no doubt I could have taken fifty. There is yet another use to which *Nepita Conferta* apparently puts the hairy wall, for I have seen several cases of the female laying her eggs on top of the deserted cocoon.

The perfect insect is on the wing during June, and another brood appears in August.

CARWAR,

H. S. WISE.

September 1st, 1886.

BIRD-NESTING NOTES FROM CUTCH.

I can corroborate Mr. Littledale's assertion that *C. affinis* (the Indian swift) takes possession of the nests of *H. erythropygus* (the Red-rumped Swallow) for on March 6, in Bhujia Fort, I caught two of these swifts in separate nests of *H. erythropygia*. One nest contained two fresh eggs, but the other was empty. *C. affinis* is not the only bird however that avails itself of the ingenious nest of *H. erythropygia*. On April 25 I took 3 eggs of *P. flavicollis* (the yellow-throated Sparrow) out of one of them. To make quite sure of its identity, I shot one of the parent birds. Also I am nearly certain that some eggs which my shikari brought me last year out of a nest of *Ploceus munyar* (striated Weaver bird) must have belonged to this species, *i.e.*, *P. flavicollis*, but I never had an opportunity of seeing the bird. April 15 I shot a pair of *Strix Javanica* (the Indian screech owl) which, as far as I know, has not been recorded from this province before. The female on dissection showed no signs of nidification. Since then I have seen a third. Within the last month, *i.e.* April I have seen Peregrine Falcons on two occasions, and also *C. acruyinosus* (the Marsh Harrier). Surely this is very late for winter visitants to be stopping, unless they are breeding. May 2 I found a partridge's nest in a very unusual situation. It was placed in a hole in the rock about 10 feet

from the ground. I climbed up and found it contained eggs, and as far as I could feel with my hand, there was no attempt at a nest, the eggs being laid on the bare sand. I may mention that I saw the bird to be the ordinary grey partridge, *P. pondicerianus*. April 25 I first observed *T. pagodarum* (the Brahminy Mynah) which I had been looking out for for some time. I have never seen them in the cold weather, so I conclude they only come here to breed. Last year I took four of their nests.

A. NEWNHAM, 10th N. L. I.

THE TWO SHAMAS.

Mr. Hume, speaking of the Shama (476 *Cercotrichas macrura*), says:—"Well might Jerdon doubt that Philipps' Shama described as perching on walls and breeding in houses, could be this species."

"Shama" is the native name for the Brown Rockchat (494, *Cercomela fusca*) throughout the Central Provinces, and it is this bird that Philipps was writing about, and not our delightful Indian songster.

"Perching on walls and breeding in houses" is a concise summary of its habits.

H. EDWIN BARNES.

MERGUS MERGANSER.

It will interest the ornithological members of the Society to know that I shot a goosander (*Mergus merganser*) at Shewa just across the Bombay harbour, on the 2nd instant (December). It was a female or immature male, and was playing along in a shallow sheet of salt water which formed the reservoir of one of the salt works. I believe this is the most southern point in India from which the bird has been recorded yet.

E. H. AITKEN.

LIST OF BIRDS FROM SIND.

PRESENTED BY COLONEL SWINHOE.

| Jerdon's No. | English name. | Scientific name. | No. of specimens. | Locality. |
|--------------|------------------------------------|-----------------------------|-------------------|-------------|
| 11 | The Lager Falcon | Falco jaggur | 1 | Hyderabad. |
| 23 | The Shikra | Astur badius | 1 | Kotree. |
| 76 | The Spotted Owlet | Carine brama | 1 | Sehwan. |
| 89 | The Indian Sand Martin. | Cotyle sinensis..... | 1 | Sehwan. |
| 123 | The Indian Roller | Coracias indica..... | 1 | Jacobabad. |
| 129 | The White-breasted Kingfisher. | Halcyon smyrnensis . | 1 | Jempeer. |
| 136 | The Pied Kingfisher ... | Ceryle rudis..... | 1 | Sehwan. |
| 148 | The Rose-ringed Paroquet. | Palæornis torquatus.. | 1 | Shikarpoor. |
| 182 | The Pale golden-backed Woodpecker. | Bachypternus dilutus | 2 | Kotree. |
| 212 | The Pied-crested Cuckoo. | Coccyzus melanoleucos. | 1 | Kurrachee. |
| 254 | The European Hoopoe. | Upupa epops | 1 | Kotree. |
| 256 | The Indian Grey Shrike. | Lanius lahtora | 1 | Kurrachee. |
| 257 | The Rufous-backed Shrike. | Lanius erythronotus.. | 1 | Kotree. |
| 260 | The Bay-backed Shrike. | Lanius hardwickii ... | 1 | Kurrachee. |
| 262 | The Pale Brown Shrike. | Lanius arenarius | 1 | Sehwan. |
| 265 | The Common Wood Shrike. | Tephrodornis pondicerianus. | 2 | Sehwan. |

| Jerdon's No. | English name. | Scientific name. | No. of specimens. | Locality. |
|--------------|-------------------------------------|--------------------------------|-------------------|------------------|
| 278 | The King Crow | Bucanga atra..... | 1 | Hyderabad. |
| 432 | The Bengal Babbler .. | Malacocircus terri- color. | 1 | Kurrachee. |
| 436 | The large Grey Babbler | Malacocircus mal- colmi. | 1 | Sehwan. |
| 438 | The Striated Bush Babbler. | Chatarrhoea caudata. | 1 | Kotree. |
| 480 | The Brown-backed In- dian Robin. | Thamnobia cam- bayensis. | 1 | Sehwan. |
| 481 | The White-winged Black Robin. | Pratincola caprata ... | 2 | Kotree. |
| 483 | The Indian Bushchat .. | Pratincola indica | 2 | Sehwan. |
| 489 | The Pied Stone Chat .. | Saxicola picata | 2 | Hyderabad |
| 491 | The Red-tailed Whea- ter. | Saxicola kingi | 1 | Kurr. |
| 492 | The Black-throated Wheater. | Saxicola deserti | 1 | Kotree. |
| 497 | The Indian Redstart ... | Ruticilla rufiventris.. | 1 | Sukkur |
| 514 | The Indian Blue-throat. | Cyanecula svecica ... | 1 | Kotree. |
| 660 bis | The Brown-necked Raven. | Corvus umbrinus..... | 1 | Larkhans |
| 674 | The Common Indian Magpie. | Dendrocitta rufa | 1 | Kotree. |
| 681 | The Common Starling... | Sturnus vulgaris | 1 | Sehwan |
| 686 | The Southern Dusky Myna. | Acridotheres fuscus. | 2 | Kotree. |
| 690 | The Rose-colored Star- ling. | Pastor roseus | 2 | Jempeer |
| 694 | The Common Weaver- Bird. | Ploceus baya | 1 | Kotree. |
| 695 | The Striated Weaver Bird. | Ploceus manyar | 1 | Hyderabad |
| 703 | The Plain brown Munia. | Munia malabarica ... | 2 | Kurrachee. |
| 706 | The House Sparrow ... | Passer domesticus .. | 1 | Kotree. |
| 721 | The Black-headed Bunt- ing. | Euspiza melanoce- phala. | 2 | Hyderabad |
| 756 | The Red-winged Bush Lark. | Mirafr erythroptera. | 1 | Kotree. |
| 794 | The Little Brown Dove. | Turtur cambayensis . | 1 | Kotree. |
| 799 | The large Sand Grouse. | Pterocles arenarius... | 1 | Jempeer. |
| 818 | The Black Partridge ... | Francolinus vulgaris . | 1 | Jempeer. |
| 822 | The Grey Partridge ... | Ortygornis pontico- rianus. | 1 | Jempeer |
| 829 | The large Grey Quail... | Coturnix communis .. | 2 | Jempeer. |
| 849 | The Indian Ringed Plover. | Ægialitis dubia | 1 | Sukkur. |
| 852 | The Black-sided Lap- wing. | Chittusia gregaria ... | 1 | Narra. |
| 856 | The Yellow wattled Lapwing. | Sarciophorus bilobus. | 2 | Mulleer. |
| 872 | The Jack Snipe | Gallinago gallinula ... | 2 | Kotree. |
| 884 | The Common Sand- piper. | Tringoides hypo- leucos. | 1 | Kurrachee. |
| 901 | The Pheasant-tailed Jacana. | Hydrophasianus chi- rurgus. | 1 | Munchur. |
| 903 | The Bald Coot | Fulica atra | 1 | Munchur. |
| 904 | The Water-cock | Gallix cinereus ... | 1 | Sehwan. |
| 907 | The White-breasted Water hen. | Erythra phoenicura. | 1 | Fukkeer-ka-Gote. |
| 952 | The Whistling Teal..... | Dendrocygna java- nica. | 2 | Kotree. |
| 957 | The Shoveller | Spatula clypeata..... | 1 | Munchur |
| 965 | The Blue-winged Teal.. | Querquedula ciria ... | 1 | Jempeer. |
| 995 | The Indian Skimmer ... | Rhyncops albicollis. | 1 | Hyderabad. |

LIST OF SOUTHERN INDIAN AND OTHER PLANTS.

PRESENTED BY JAMES A. MURRAY.

| | Locality. |
|--|-------------------|
| <i>Anaphalis neilgherriensis</i> | Neilgherry Hills. |
| „ <i>notoniana</i> | „ |
| <i>Budlea discolor</i> | „ |
| <i>Centranthera humifusa</i> | Wynaad. |
| <i>Sophubia</i> sp. | Poolachee. |
| <i>Alsycarpus longifolius</i> | Bermuda. |
| <i>Desmodium congestum</i> | Annamallays. |
| „ <i>latifolium</i> | „ |
| „ <i>recurvatum</i> | „ |
| „ <i>diffusum</i> | Jubbulpoor. |
| „ <i>gangeticum</i> | Madras. |
| „ <i>triquetrum</i> | Moulmein. |
| „ <i>gyrans</i> | Rangeon. |
| <i>Lonicera Leschenaulti</i> | Ootacamund. |
| <i>Viburnum capitellatum</i> | Coonoor. |
| <i>Pothos scandens</i> | „ |
| <i>Gomphostemma Heyneanus</i> | Anamallays. |
| <i>Dicerna biarticulatum</i> | Neilgherry Hills. |
| „ <i>pulchellum</i> | „ |
| <i>Zornea</i> sp..... | Madras. |
| <i>Sesbania Ægyptiaca</i> .. | St. Thome. |
| <i>Tephrosia hirta</i> | Venkatagherry. |
| „ <i>purpurea</i> | Neilgherries. |
| „ <i>suberosa</i> | Juggiapet. |
| <i>Atylosia neilgherriensis</i> | Neilgherry Hills. |
| <i>Jonesia asoca</i> | Condapilly Hills. |
| <i>Acacia pulchella</i> | Ootacamund. |
| „ <i>robusta</i> | „ |
| „ <i>verticillata</i> | „ |
| „ <i>dodonæfolia</i> | „ |
| „ <i>longifolia</i> | Neilgherry Hills. |
| <i>Gnetum funiculare</i> | „ |
| <i>Genista lutea</i> | „ |
| <i>Clerodendron infortunatum</i> | „ |
| <i>Cinnamomum ovalifolium</i> | „ |
| <i>Indigofera linifolia</i> | „ |
| <i>Cajanus Indicus</i> | Madras. |
| <i>Indigofera cordifolia</i> | Neilgherry Hills. |
| „ <i>pentaphylla</i> | „ |
| <i>Crotalaria Wallichiana</i> | „ |
| „ <i>rubiginosa</i> | „ |
| „ <i>anthylloides</i> | Waltair. |

| | Locality. |
|---------------------------------------|-------------------|
| <i>Crotalaria barbata</i> | Neilgherry Hills. |
| <i>Gomphocarpus fruticosus</i> | Madras. |
| <i>Cressa Indica</i> | " |
| <i>Olea robusta</i> | Neilgherry Hills. |
| <i>Ilex wightiana</i> | " |
| <i>Melaleuca leucodendron</i> | Madras. |
| <i>Tetranthera ligustrum</i> | Neilgherry Hills. |
| <i>Litsaia ceylanica</i> | " |
| <i>Gyrocarpus odorata</i> | " |
| <i>Laurus cinnamomum</i> | Ankapelly. |
| <i>Hamelia patens</i> | Madras. |
| <i>Pentas carnea</i> | " |
| <i>Galium asperifolium</i> | Neilgherry Hills. |
| <i>Rubia cordifolia</i> | " |
| <i>Hymenidictyon obovatum</i> | " |
| <i>Mussænda frondosa</i> | " |
| <i>Knoxia corymbosa</i> | " |
| <i>Pavetta brunonis</i> | Coimbatoor. |
| <i>Ixora parviflora</i> | Madras. |
| „ <i>coccinea</i> | " |
| <i>Ixora rosea</i> | Madras. |
| <i>Eugenia Arnottiana</i> | Neilgherry Hills. |
| „ <i>Jambolanum</i> | Madras. |
| <i>Eucalyptus perfoliata</i> | Neilgherry Hills. |
| <i>Valeriana brunoniana</i> | " |
| <i>Ærua javanica</i> | Madras. |
| <i>Hydrocotyle rotundifolia</i> | Ootacamund. |
| <i>Goughia neilgherriensis</i> | Annamallays. |
| <i>Macrea oblongifolia</i> | " |
| <i>Neurocalyx Hookeriana</i> | Wynaad. |
| <i>Ophiorrhiza munghos</i> | Annamallays. |

Total 73—species.

PROCEEDINGS OF THE SOCIETY DURING THE QUARTER.

THE usual monthly meeting of this Society took place on Monday, the 4th October, and was largely attended. Dr. D. Macdonald presided.

The following new members were elected :—Mr. R. Roberts, Mrs. John Jardine, Mr. Jamsetjee C. Jamsetjee, Mr. Cawasjee Day Limjee, and Mr. D. D. Opiumwala.

Mr. H. M. Phipson, the Honorary Secretary, then read the following list of contributions received since last meeting :—

| Contribution. | Descriptions. | Contributer. |
|---|--|--------------------------|
| 1 Monkey-mouthed Shark... | <i>Stegostoma tigrinum</i> | Mr. E. H. Aitken |
| 1 Wart Hog's Skull | From Somali Coast | Capt. W. Avis. |
| 1 Koodoo's Head | Do. do. | Do. |
| 1 Armadillo's Skin | Do. do. | Do. |
| 1 Tortoise Shell | Do. do. | Do. |
| 1 Gazelle (alive) | Do. do. | Do. |
| A quantity of Snakes | Do. do. | Do. |
| A quantity of Fish | From Aden | Do. |
| 2 Bats | From Mahim | Mr. C. Anding. |
| A quantity of Sea Shells and Birds' Nests. | Do. | Mr. Jas. Mason. |
| 1 Large Horned Owl (alive). Nest and Eggs | From Lanowli | Mr. S. J. Sarjant. |
| 1 Duck (alive) | <i>Prinia Stewartii</i> | Mr. R. Wroughton. |
| A quantity of Fish, Crus- taceans and Marine Animals. | From Alibag | Mr. W. F. Sinclair, C.S. |
| | Do. | Do. |
| 1 Chamoleon (alive) | <i>Chamelio vulgaris</i> | Mr. H. Barrett. |
| 1 Snake | <i>Dipsas gokool</i> | Mr. F. Kirby. |
| 2 Lizards | <i>Sitana Pondiceriana</i> | Mr. H. M. Phipson. |
| 1 Long-tailed Forest Squirrel | <i>Sciurus Macrourus</i> from Ceylon. | Mr. G. H. Hampton. |
| 1 Ostrich | | Victoria Gardens. |
| 3 Snakes | From Sangor, C. P. | Mr. H. E. Barnes. |
| 1 Bustard | From Malegaon | Mr. H. Anderson. |

MINOR CONTRIBUTIONS.

From Miss Johnstone, Mr. Daley, Mr. R. Roberts, Dr. Weir, Captain E. F. Becher, and Mrs. A. K. Oliver.

CONTRIBUTIONS TO THE LIBRARY.

"Annals and Magazine of Natural History" (No. CV.), by Mr. H. Littledale;
"Catalogue of Birds in Lucknow Museum," by Mr. G. Reid; "Proceedings of the
Linnean Society of N. S. Wales (Vol. 1.); and "Catalogue of the Library of N. S.
Wales."

Mr. E. L. Barton exhibited several heads of tiger, panther, and markhor, mounted by him, which were greatly admired.

In an adjoining room, which the Anthropological Society had kindly lent for the occasion, an exhibition was held, showing the different kinds of fruits and vegetables which are obtainable in Bombay at this season of the year. The collection consisted of 175 different varieties.

Mr. H. M. Phipson acknowledged having received the greatest assistance, from Dr. Kirtikar, Mr. W. F. Sinclair, and Mr. Nanabhoy F. Davur, in purchasing, arranging, and naming the specimens. Many of the exhibits came from private gardens, and a vote of thanks was proposed to the following gentlemen who had sent in specimens for exhibition :—

Mr. Frank Jefferson, the Hon'ble Mr. Justice Birdwood, Mr. Cewasjee M. Dadabhoy, Mr. Sorabjee D. Dubash, Mr. Nanabhoy F. Davur, Mr. Kaikabad D. Ghandy, Mr. P. B. Brunton, Dr. Weir, Mr. J. Anderson, Mr. N. S. Symons, and the Superintendent of the Victoria Gardens.

Dr. Kirtikar then read out a list of the natural orders of the vegetables obtained by the Society from the Crawford Markets, incidentally touching on those sent up by some of the members of the Society individually. He briefly explained the uses of some of the vegetables and fruits. Beginning with the grass-order, Dr. Kirtikar said, there was a very well-developed stalk of Jowari or *Sorghum vulgare*, exhibited by the Hon'ble Mr. Justice Birdwood, which showed to what height it could grow under favourable circumstances. It went up as high as 12 feet before it threw out the ear of corn. Side by side with the Jowari plant was a beautiful specimen of sugarcane (*Saccharum officinarum*), grown on the "Kutchra" ground of the Municipality. Dr. Kirtikar dwelt on the importance of using "made ground" for cultivation purposes, the decaying animal and vegetable matter from which, he said, afforded much nutritive matter to plants, at the same time serving as an effectual method of the disposal of refuse matter. Vegetation, he hoped, thus carried on would remove some of the offensive odours which have been the characteristic of the Byculla Flats. There was one special kind of vegetable belonging to the grass-order which he said was entirely unknown to many. It was the tender off-shoots of the Bamboo (*bambusa arundinacea*) known among the Hindus as *vasota*, which made very good pickle with the juice of sour limes, and common salt. He must not omit, he said to mention that there were a few rice-bearing stalks of the *Oryza sativa*, which formed the staple food of the Hindus of the Konkan and Deccan. He next described the uses of lemon grass, known as *ola chah*, "green tea," or *Andropogon citratus*, used principally by the Parsees for flavouring their tea. Oil is also manufactured from it. He next described the uses of some of the Arads available now, such as the *Amorphophallus campanulatus* (Sooran) and *Colocasia antiquorum* (aloo), the acidity of which was removed by the use of garlic and ginger, and by boiling in salt and water before making up the dish. Touching the Natural Order Musaceæ he remarked that though there were several specimens of plantains in the day's collection, it was not a season for plantains. There was one remark, however, he wanted to make, he said, regarding a special variety of the plantain which came from the village of Agashi in Bassein Taluka. This variety of plantain was the only one that could be dried in the sun for preservation. The plantain, he said, was peeled and dipped in honey and exposed to the sun for seven or fifteen days. It was an industry which was confined to Agashi only. Several attempts were made in the surrounding villages to improve the trade by growing this special variety of plantain, but the results had not produced plantains worth preserving. Why this should be, Dr. Kirtikar observed, was a problem to botanists to solve. Referring to the *Borassus flabelli-formis* (fan-leaved palm), he remarked that the fruit was very tender and delicate eating, a great favorite among children. The water it contained was delicious and refreshing. Regarding the *Areca catechu* (supari) and *Piper betel* (pan), he observed they made the usual dessert of the Hindu after his meal, and formed the *rida* when eaten with a little catechu, chunam, a few grains of cardamoms, some cloves, a bit of nutmeg or mace. Among the *Anacardiaceæ* were the Kajoo and Charoli, both used dry, the latter for adorning Burfi, made by boiling milk with sugar over a gentle fire, and thickening it, and the former for sweetmeats and curries. There was a specimen of mango from Bangalore—smellless and perhaps tasteless; steam communications had rendered it available now. In former years one could not imagine getting a mango in these days. Among the *Euphorbiaceæ* there were the *Cicca disticha* and *Phyllanthus emblica*, the latter of which was very largely used in Poona for making an excellent preserve. Among the *Solaneæ* were the Loveapple and

Brinjal, both very delicious vegetables. There was the *Carica papaya*, two varieties of the fruit of which were exhibited, one growing as usual from the tree bearing female flowers only, and the other growing on a plant bearing both male and female flowers. The former was readily distinguished from the latter by its short and thick peduncle or pedicel, the fruit growing from the latter having a long curved and slender peduncle, and several flowers on it, the peduncle often branching and giving off other fruitbearing flowers. The papaya is largely used now as a digestive agent, and makes good pickles. The ripe fruit is also good. The Umbelliferae were represented by the Carrot (*Daucus carota*), Parsley and Celery. There was also the green needle-shape leaved tender plant grown from *Anethum sowa*, which goes among the Hindus under the name of *Shepu*, and is used as greens. Coming to the natural order Cucurbitaceæ, he said it was the plant of the season giving some of the finest and most delicious dishes a vegetarian could command. A specimen of *Tricosanthes palmata* (Kaundal) was exhibited by a member alongside of the edible vegetables, but it was bitter and used for poisoning cattle. It was beautifully red when ripe, but utterly useless except medicinally or as poison. Among the Leguminosæ, he said, there were many which supplied abundant vegetables; the *Dolichos Lablab* (Papdi) was good in curries, the *Dolichos sinensis* (Chowli) was very pleasant and delicate eating. Everybody knew the pea. The peculiar four-angled, fringed pod of Chowdhar when cooked in thin slices with butter, salt, and pepper afforded an agreeable tender dish. The tamarind supplied the place of vinegar in Hindu household economy. On account of the lateness of the hour it was impossible to enter into the details of the several other orders. But he hoped that on some future occasion he would be able complete his observations and supply a few notes on the economic aspect of the various fruits and vegetables growing and procurable in and around Bombay.

THE usual monthly meeting of this Society was held on Monday, the 1st November, and was largely attended.

The following new members were elected:—Messrs. F. D. Parker, H. W. Barrow, Charles Taylor, A. W. Morris, Alexander Descubes, W. M. Daly, S. Hornidge, E. Litchfield, W. C. Taylor, H. J. Hemming, and E. L. Luard.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections:—

| Contribution. | Description. | Contributor. |
|---|-----------------------------------|--------------------------|
| A quantity of Fish, Lizards and Bats. | From Carwar..... | Mr. H. S. Wise. |
| A quantity of Insects | Do. | Do. |
| 1 Sarus Crane | Alive | Mr. H. Barrett. |
| A quantity of Shells | From Mauritins..... | Mr. Alex. Descubes. |
| 1 Snake..... | Typhlops brahminus..... | Do. |
| 68 Birds' Skins | From Sind | Col. Swinhoe. |
| A large collection of Butterflies and Moths. | From Bombay | Mr. Fraser Hore. |
| Skin of Red-bellied Flying Squirrel. | <i>Pteromys magnificus</i> | Major G. Poole. |
| Skin of Grey Flying Squirrel. | <i>Pteromys fimbriatus</i> | Do. |
| Skin of Leopard Cat | <i>Felis Bengalensis</i> | Do. |
| 1 Bear's Skull | <i>Ursus labiatus</i> | Mr. E. L. Barton. |
| 1 Australian Red Parrot ... | Alive | Mrs. M. C. Turner. |
| 1 Monkey Mouthed Shark... | <i>Stegostoma tigrinum</i> | Mr. W. F. Sinclair, C.S. |
| 1 Eel..... | <i>Sp. Muræna</i> | Do. |
| A quantity of Coralines ... | From Alibag | Do. |
| A number of the new Species of <i>Balanophora</i> . | From Mahableshtar | Mr. W. E. Hart. |

MINOR CONTRIBUTIONS.

From Mr. W. W. Squire, Mr. H. Sinwald, Mr. R. N. Mant, Mr. James Conroy, Mr. F. L. Maguire, Mr. H. Hatch, Mr. M. C. Turner, Colonel Walcott, Mr. R. Gilbert, Mr. P. R. Wilson and Dr. Weir.

CONTRIBUTIONS TO THE LIBRARY.

"Bulletin of the American Museum of Natural History, New York," in exchange; "Annals and Magazine of Natural History" (No. CVI.), H. Littledale; and "Journal of the Asiatic Society of Bengal" (Nos. I., II., III.), in exchange.

EXHIBITS.

Tigers' skins, with four unborn cubs, and two panthers' skins, Mr. Sarjant; one head and skin of doe antelope, with horns, $22\frac{1}{2}$ inches in length, His Highness the Maharaja of Jodhpore; and one wild Buffalo's head, mounted by Mr. E. L. Barton, and shot by Mr. J. D. Inverarity.

The Honorary Secretary announced that H. H. the Maharaja of Rutlam had sent a donation of Rs. 50 to the Society.

Owing to the indisposition of Dr. D. Macdonald his paper on Cobra-bites was postponed.

Mr. J. H. Steel (Bombay Veterinary College) then read the following paper, illustrating his remarks with diagrams and spirit specimens:—

I wish to introduce to you this evening a number of zoological characters who have a more or less bad reputation, and, because they love darkness rather than light, are presumed to be workers of evil. Whether the bad name these organisms have received, and the aversion with which they are looked on by their fellow-animals, men, is just or no, will be explained in the sequel, let it for the present be remembered that doubtless parasites from their own particular point of view are highly respectable characters. As even the study of criminal tribes and outcasts has a value and much interest, and the pursuit of such specimens of humanity is not pleasant except for the zest of the chase and love of danger, which most men experience more or less, so the shikar of parasites of higher animals is at first not pleasant; but when employed in this way soon one forgets any offensiveness of surroundings and feels keenly somewhat as does the foxhunter while the covert is being drawn, or the *shikaree* when the beaters are at work. And this research has high value, for, strange as it may seem to some of you, these small inhabitants of our bodies are more dangerous foes to the lives of higher animals than are even the tiger or the cobra. For very numerous and fatal diseases are due to parasites; thus the rot of sheep, which often ruins sheep-farmers, is due to "Flukes" in the liver; the "Pip," which carries off poultry, depends on worms in the windpipe; and the Trichina, which mankind obtain from pork, and which often kills the human being unfortunate enough to obtain it, is a small round worm barely visible to the naked eye.

"We really know less of the habits of internal parasites than of the formidable denizens of the jungle," whereas common sense and policy would suggest to us to know more with a view to their avoidance and extirpation, as they are our more bitter foes. I wish to direct your attention to the way in which these creatures "live, move, and have their being," and with a view to introducing the subject have selected what to parasites is a geographical region, the equine organism or system of the horse. It is, as concerns our internal parasites, not a very favourite country

as compared with the canine organism or the bovine organism, and yet it is fairly well frequented, and the inhabitants are of various castes and manners. The country is a fairly hot one, and very uniform in temperature, the thermometer constantly standing at about 100° F., with a range of not more than a couple of degrees. A moist country, moreover, in most parts, but not without fairly dry spots, which are sometimes frequented. The air varies very much in different parts. On the large canal known as the alimentary, it consists principally of carbonated and sulphuretted hydrogen. In the passage known as the respiratory it is beautifully fresh, but very moist, and with a genial warmth about it. Fortunately for the inhabitants of this geographical region, they can utilize the oxygen contained in the surrounding fluids by absorbing it through the skin surface; they, therefore, are not concerned as to whether their atmosphere is good or bad, and having neither lungs nor bronchi do not dread either asthma or pneumonia. This is rather fortunate for them as, we shall shortly see, they are apt to be abruptly turned out into the cold.

A wonderfully disturbed region is the alimentary canal above-mentioned, sometimes narrow, sometimes expanding into broads, and always agitated by a peculiar churning motion most aggravating to a parasite, were it not that it is thereby saved the trouble of going far to seek food. One can hold fast in such a place by means of anchors and pincers, as received through the beneficent foresight of Providence, and in case and luxury collect the beautifully prepared morsels which are brought to our mouths by the constant movement of our canal home in ever fresh supplies. We can adopt the tactics of the oyster, but our food is better prepared than his, and we do not need even the lazy motion of arms to grasp it, or the waving to and fro of nets to catch. A jovial life the inhabitant of the alimentary canal leads until in an unguarded moment he happens to let go his hold; then he is pushed from his broad residence through numerous narrows probably filled with food offensive to his palate, and at last is by cruel fate expelled even from the equine organism, and left to do as best he can when suddenly exposed to the terrible influence of a temperature of but 60° F. Happy is the worm who before becoming the victim of so tragic a fate has made provision for the future of his race, and can die happy in the assurance that his ova will resist those influences to which he has succumbed, and that, in due course, his progeny will enter the region he has lost and carry on his life's works! Let us take some few of the inhabitants of the equine organism, and see what manner of beings they are. The alimentary canal of the horse has on its course a large pouch called the stomach, in which we are almost sure of a "find," in India especially. On cutting open this pouch we note its lining membrane to be of two parts, one quite white, the other reddish white. On the former part we shall probably find what the uninitiated would call maggots, but what are commonly called "Bots"; on the latter part we shall very likely see innumerable small thread-like worms really of two kinds called "great mouths" and "little mouths" (spiroptera), and probably some "abodes" which they have made for themselves. (1) The Bots are maggots of the Gad fly, that is they are the young of certain winged insects for which Nature has found a most comfortable abode in which they may develop. When they wish they can hold on by two black prickly-like hooks which they have at one end, and when they want to move on they can do so after the manner of worms, joint by joint, gaining a grip on the surface over which they are travelling. As the part of the mucous membrane to which they are attached is very smooth, each joint has on it numerous horny spines which give a good grip. These bots are not harmless to the horse. A few cause him little inconvenience, but many may even cause

his death. I have known cases where they were sufficiently numerous to cause a blocking up of the passage from the stomach into the bowel. Recently I treated unsuccessfully a pony which had an abscess in the loins, caused by bots which had pierced the walls of the stomach. In other cases severe indigestion is caused. If in the autumn or early spring your horse falls away in condition, eats earth or white-wash, or likes to lick anything cool; if he frequently straightens the head out and turns the upper lip inside out, and is "foul" (to use a term well-known to horsemen), he probably suffers from "worms," not improbably bots. Now it is one thing to put medicine down a horse's throat and into his stomach, but quite another thing to get the worm to take his share of the dose, so bots are often difficult to get rid of; however, it is possible to make them very uncomfortable for a few days by giving the horse doses of turps, salt, or green vitriol, and when this has made them thoroughly discontented with their surroundings, clearing them out by a dose of aloes. Bots are representatives of what are termed "partial parasites." Their residence in the horse lasts very much longer than the other phases of their life. Whenever by accident or in the course of their life's work, they pass from the body and fall to the ground, they wriggle into grass or loose soil, and become Chrysalides, and in due course the gadfly escapes. It is a most pertinacious insect, which deposits its eggs on the long hair of the legs of horses. The eggs adhere by a kind of glue which seems somewhat acrid in its character, for the horse constantly bites and licks the part on which the eggs are attached. His warm saliva loosens the gummy substance, and the eggs (or larvæ) are carried into the mouth and in due course down to the stomach, where the young bot escapes as soon as convenient by lifting up an operculum or lid at one end of the shell. A few bots give little if any trouble.

2. The Spiroptera, "great mouths" and "little mouths," are extremely frequent in this country, but not often seen in England. They are Nematodes or round worms, and of considerable importance to owners of horses. The "little mouths" live free in the cavity of the stomach over the soft part of the mucous membrane, which they cause to become thick and congested, and covered with a very thick viscid mucus, worms and mucus together forming a wriggling, seething mass. A harness horse which I owned some four years ago, was a victim to these small tormenters. Feed him as we would, we could get no flesh on his bones, nay rather he continued to fall away, although he used to eat voraciously and with depraved appetite. He showed a peculiar crankiness of humour, so that at times no amount of persuasion would cause him to go. Finally he was destroyed, and the soft part of his stomach was found to be quite concealed by myriads of these small round worms.

The "large mouths" construct themselves residences in the stomach, which have been formed into "abodes" or "nests"; these are abscesses in the wall of the stomach, practically between the mucous and muscular coats which become matted together as a result of inflammation and form a single or divided cavity in which is much pus, and which opens by one or more "mouths" into the cavity of the stomach. The "large mouths" seem to live on pus, the small mouths on mucous and perhaps stomach contents. In a considerable proportion of horses opened in India there are found gastric abscesses, or the remains of the "cysts," as caused by the great-mouthed round worm. Sometimes the cysts are of enormous size, and it may be easily understood what an amount of pain must have been caused in the formation of these abscesses, and that many an obscure case of colic or indigestion may be traced to this cause. Proper care in cleansing the food of horses is an important

means of prevention of invasion by these parasites, a liberal salt ration with the feed, and occasional doses of worm medicines will prove beneficial. The pus-eating "great mouths" in their cysts are the most difficult to get at; cases of rupture of the stomach, which are not an infrequent occurrence among horses in India, are often due to the weakening of the coats of that organ as caused by this parasite.

3 The large headed ascaris (*A. megalocephala*) is an enormous white round worm, found generally in the small intestine, sometimes in the stomach. His importance as causing disease is in no way proportioned to his size. He probably gets into the stomach simply by making a journey of exploration from the intestine. The male is smaller than his spouse, and decidedly of second-rate importance in the domestic circle, a very common feature among entozoa. When the syce lugubriously brings one of these worms in the morning and urges that his horse wants medicine, no apprehension should be excited in the owner's mind, but the horse will be the better for a course of iron tonics. Yet these worms, though some of the largest, are among the least formidable to which horses are liable. Only when they are present in very large numbers do they cause mischief, and then purely in a mechanical way, by blocking up the bowel; the wild ass recently examined by me had over one hundred in him. They are rather rare among stabled horses in India.

4. No part of the alimentary canal of the horse has a richer fauna than the cæcum and commencement of the colon. Three species are specially frequent there; among them we will first of all notice a blood-sucking parasite, which, though small in size, does much mischief. He can't be mistaken; like a British infantryman he is known by his red colour. His looks betray him, and enable us at once to distinguish between him and the armed strongyle of which we shall speak directly. He is armed with four spines (*Str. tetrawanthus*), which enable him to "tap" the small blood vessels of the bowel when he is thirsty, a small red spot indicating where he has been carrying on his operations. His development is shown to us in a very remarkable manner. If you examine the mucous membrane of the cæcum you will find it dropsical and pulpy, as a result of irritation caused by these worms, and if you peel it off and hold it up to the light, you will find the offenders in many cases in enormous numbers, simply curled up in the substance of the membrane, some scarcely visible with the naked eye others almost as large as the adults. They were first described as "Trichina-like" organisms. These blood-suckers cause fatal diarrhoea in colts, and may be considered among the most formidable to which the horse is liable; fortunately adult stabled horses do not much suffer from them. In one outbreak over one hundred ponies are reported to have died from this cause.

5. With these last are liable to be confounded the "palisade" or wandering armed worms which occur in their adult form, especially in the cæcum and colon: they are larger and stiffer than the blood-suckers, and have a black line instead of a red one running up through them: this is because they feed on the dark contents of the bowel. They are, therefore, much less troublesome as adults than their red companions. Their principal importance arises from their adventurous youth, during which they wander strangely. Sometimes the young strongyles are seen in the eye, but another species is much more frequent there, as we shall see directly. An armed strongyle may turn up in almost any part of the body, but is extremely frequent in the arteries of the bowels, where he gives rise to disease (aneurism). You can seldom open the body of an old ass without finding in his bowel-arteries either young armed strongyles, or traces that they have been there, depending on the time of year. These aneurisms are considered a frequent source of colic in the horse, at any rate

they must cause the animal considerable pain, and interfere with proper nutrition, especially of the bowels. The young strongyles are able to travel about, in consequence of the boring apparatus on their heads, but generally prefer a much easier method of progression. They bore into the blood vessels, and are carried by the blood current to different parts of the body, and so we can easily understand how they may turn up anywhere. The very young and the adult worms live in the alimentary canal of the horse; the latter escape from the bowel and discharge eggs which are hatched by natural influences, and the young escape into the soil, and enter the bodies of small snails, where they reside comfortably until the snails are swallowed with food by the horse. They then escape into the stomach and intestines, and bore their way through the walls of the alimentary canal. The adults can be expelled and killed by "worm medicines," especially *santonin*.

6. The "wandering eel-like worms" (*Filaria papillosa*) must not be mistaken for armed strongyles. We seldom open a horse in this country without finding wriggling about in the warm moist cavity of the abdomen one or more long white worms, the males with corkscrew tails, but smaller than the females. But one of the most familiar appearances of these creatures in an immature form is in the eye of the horse, occasionally of the ox. The eel-like worm of the eye of the horse can be seen quite plainly at first disporting himself in this natural aquarium, but very soon he gives rise to so much irritation as to cause complete clouding over of the eye and often permanent loss of sight. A surgical operation for removal of the worm has to be resorted to, and very frequently proves quite effectual. The parasite is much more frequent in low-lying marshy districts than in others, and in India notably occurs in Lower Bengal. It is remarkable that worm in the eye is practically never seen in England, and therefore its treatment is a speciality of Indian Veterinary Surgery. In other respects this worm is known to cause serious inflammation of the organs of the abdomen.

The England "Flukes" or flat worms (*Fasciola hepatica*), like those which cause rot in sheep, are not uncommon as cause of diseased liver in horses and asses. In India this species seems rare, but a near ally, the Amphistome, is very common and rather important. On opening the cæcum and colon we not unfrequently find enormous numbers of small reddish bodies, like grains of barley, mixed with the bowel contents. These on examination prove to have a sucker at each end of the body, which used to be mistaken for mouths, hence their "mouth at both ends." They cause a good deal of irritation, and in their effects resemble and are nearly as serious as the blood-sucking strongyle, than which they in India are more frequent. Liberal salt ration is the best preventative of them, and, indeed, a measure to which all horse owners in this country should constantly resort, care being taken that the horse, not his syce, obtains the benefit of the salt. These amphistomes like other flukes are remarkable for the complex and numerous developmental stages through which they pass. At one time swimming freely in tank water in all the glory of a long tail, at another ignominiously encysted in the body of snail, finally settling down not uncomfortably to a fat living, enjoying *otium cum dignitate* in the cæcum or colon of the horse. There are many animals that have a much worse time of it than a fluke! Individual flukes, unlike strongyles, contain both male and female organs.

8. Tapeworms are not frequent in the adult form in vegetable feeders, although among the principal parasite torments of flesh-eaters and man. Yet we do see small *tæniæ* in the large bowel of the horse; in so far as my experience goes, very rarely

in India. They are so short and peculiar in appearance as to be hardly recognizable as tapeworms. They give rise in some cases to severe irritation in the bowels. What is the source of the most frequent tapeworm of the horse is not known, but our knowledge of the development of other Tapeworms gives us some clue.

9. Thus the horse like other herbivora (but not nearly so frequently as the ox and camel) has often in his liver and lungs, what are known as Hydatids or Hydatid cysts. These look like white tumours, sometimes bigger than a cricket ball, in other cases no bigger than a pea. When cut into liquid contents squirt out with force often into the eyes of the enthusiastic student of Zoology. These contents are watery for the most part, but have little white grains in them which, examined under a low power, are found to be tapeworm heads; the tumours in fact are the cystic or bladder stage of development of the tænia which, more than mankind, deserves Shakespeare's description, a one individual "in its time playing many parts," its acts being seven ages—

1. First the "Ovum" with its shell expelled into the world.
2. And next the "sixhooked embryo" wandering free,
3. Then boring through the tissues of the host becomes a "Cyst,"
4. Which nurse-like from its inner coat develops young,
5. The "Scolices," or heads which bear a ring of hooks
6. Hydatids swallowed by flesh-feeders lose their coats, but many heads
7. Develope into fruitful Tapeworms and each segment bears ova in many thousands to preserve the race.

I have never known a horse die from Hydatids, but cattle suffer much from them.

10. The sharp tails (Oxyurides) must for the present complete our imperfect enumeration of equine parasitic organisms. They are probably the most familiar, because they reside in the terminal portion of the alimentary canal and are expelled often in enormous numbers. Almost every horse brought in from the districts has some of these worms. They are feeders on excrement, cause little mischief, and can easily be recognised by their having a round firm body, and a soft tail-half to it. They are something like a thick whip with lash as stout almost as and not longer than the handle. Although not very serious they cause irritation, and many a tail spoiled by rubbing is due to the presence of these worms. One of the most common and distinctive indications of their presence is a brownish white deposit around the posterior outlet of the alimentary canal, and sometimes a specimen will be found to have become entangled in its passage through the opening. Syces bring specimens with great triumph as proof of the necessity for a native worm medicine of considerable value, Palas papra seeds. The best treatment, however, for the form of parasitic organism is *Injectio Terebinthinæ*. The larvæ of Oxyurides hatch out in the earth, then enter some animal in which they become changed into the hermaphrodite form. Those of *Ascarides* and *Filaria* lie encapsuled in some animal, and with it pass into the digestive system of some other animal-form in which they become adult; those of *Strongyles* live in the earth, and assume the adult condition in some animal (Von Linstow). Such are some of the remarkable variations in metamorphoses shown by Nematodes.

I trust my brief sketch has established my position that internal parasites are worth studying by the naturalist, to whom nothing should be common or unclean!

THE usual monthly meeting of this Society took place on Monday, Dec. 6th, Dr. D. Macdonald presiding.

The following new members were elected:—Mr. Proctor Sims, Mr. R. D. Hare, Mr. A. Conroy, Mr. J. S. Ashby, Mr. C. Sykes, Major Elliston, and Mr. H. Gonne.

Mr. H. M. Phipson, the Honorary Secretary, then read the following list of contributions, received since the last meeting:—

| Contributions. | Description. | Contributor. |
|--|-------------------------------------|--------------------------|
| 20 Birds' Skins | Collected at Simla for the Society. | Capt. W. R. L. Anderson. |
| A quantity of Insects..... | From Belgaum | Mr. H. E. Andrews. |
| Lizards and Snakes..... | From Cutch | Mr. A. Newnham. |
| 1 Civet Cat | <i>Viverra malaccensis</i> | Mr. Thos. Lidbetter. |
| 1 Bronze Winged Jacana. | <i>Parra indica</i> | Major Lyons. |
| An Herbarium (containing 180 specimens.) | Bombay Flora | Mrs. Succaram Arjoon. |
| 1 Black Buck's head | From Hurda, C. P. | Mr. Alfred Walker. |
| 1 Chinkara's Head | Do. | Do. |
| 4 Snakes | From Moulmein | Mr. M. C. Turner. |
| 2 Skulls | | Mr. M. H. Nazar. |
| A 4-legged Chicken | From Shahabad | Mr. A. Witt. |
| 7 Snakes | From the Punjab | Major Yerbury, R. A. |
| 14 Lizards | Do. | Do. |
| 1 Civet Cat (alive) | <i>Viverra megaspila</i> | Capt. W. H. Walker. |
| Teeth of Sperm Whale. | | Do. |
| A Collection of Moths and Butterflies. | Types | Col. Swinhoe. |
| Skin of Red Cat Bear. | From Nepaul..... | Mr. Chester Macnaghten. |
| 1 Porcupine Fish | | Mr. E. M. Slater. |
| 2 Black Bucks' Heads | | Do. |
| 1 Chameleon (alive) | <i>Chamaeleo vulgari</i> | Capt. F. B. Peile. |
| 1 Large Bee's Comb | From Govt. Dockyard | Mr. W. J. Killen. |
| 1 Fresh Water Tortoise (alive). | | Miss Langley. |
| 1 Snake | <i>Simotes Russellii</i> | Mr. John O'Connell. |
| 2 Lesser Civet Cats (alive.) | <i>Viverra malaccensis</i> | Mr. T. W. Cuffe. |
| Blind Fish from the Caves of Adelsburgh. | <i>Proteus anguinus</i> | Dr. H. J. C. Godfrey. |
| Several Birds' Skins | | Mr. J. D. Inverarity. |
| Nest of Loten's Sun Bird. | <i>C. lotenius</i> | Mr. E. H. Aitken. |

MINOR CONTRIBUTIONS.

From Colonel Portman, Captain L. Herbert, Mr. C. W. L. Jackson, Mr. Burwan Jayram, Dr. Temperley Grey, Mr. C. R. Brendon, Mr. E. C. Crawley, Mr. G. B. Reid, C.S., Mr. M. C. Turner, Mr. J. Wallace, Mr. W. R. Hamilton, and Mr. F. D. Parker.

EXHIBITS.

"A long-tailed Japanese Cock" with a tail measuring 8 feet 9 inches, Mr. F. D. Parker; "A Lion's Skin" (shot in Kattiawar), Captain W. P. Kennedy; "Two Ovis Poli Heads" (from Yarkand), Mr. R. A. Sterndale.

CONTRIBUTIONS TO THE LIBRARY.

"Flora of British India" (Hooker) Part XIII, from the Government of Bombay; "Portraits of the Game Wild Animals of S. Africa" (Harris), Mr. Dhunjeebhoy H. Wadia; "Butterflies of India" (Marshall and de Nicville), Vol. II., purchased; "Indian Silk Culture" (T. Wardle), from the author; "Glossary of Vernacular Names of Drugs" from Dr. Dymock; "Zoological Society of London," Reports, 1863-4-5 from the R. Z. S. of London; "Geological Survey of India Record," Vol. XIX., part 4, from the Registrar.

Mr. R. A. Sterndale exhibited two splendid Heads of the *Ovis Polii* which had been sent to him for sale at Rs. 200 each. Mr. Sterndale dwelt upon the rarity of this giant sheep, which inhabits the lofty snow-clad mountains north of Kashgar and Yarkand. No English sportsman had, he said, ever succeeded in shooting one of these animals, and it was consequently of the greatest importance that the Society should, if possible, secure one of these heads for its collection, as such an opportunity might not occur again.

A feeling of regret was generally felt that the funds at the disposal of the Committee were not sufficient to enable them to purchase either of the heads.

Dr. D. Macdonald then read the following paper on

COBRA BITES.

Members of the Society may have noticed more than two months ago in the daily newspapers the announcement that the stuffer at the V. and A. Museum had been bitten by a tame cobra, and that he died in consequence of the bite. As there are some points of scientific as well as public interest, I have thought it advisable to bring the case before the Society.

The snake was purchased for the Museum six weeks before the unfortunate accident took place. As usual the fangs were extracted, and in order to make the snake if possible more completely harmless, part of the poison duct was cut out as well. There are three principal parts in the poison apparatus of a cobra—(1) the gland which secretes the poison; (2) the perforated fang, which pierces the body of the bitten animal, and at the same time permits the poison to pass along its canal, into the wound made by the fang; and (3) the duct along which the poison passes from the gland to the hollow tooth.

As may be seen in the illustrations here there are several reserve fangs, very small, varying in size, lying loose in the surrounding flesh, and in a loose capsule. Each of these, one after the other, moves forward to take the place of the perfect fang, when that becomes broken or injured, and becomes firmly united to the maxillary bone. Some months are required for the full development of these extraordinary or supplementary teeth, but whenever one of these moves forward to take the place of an injured or extracted tooth, it is capable, as soon as it can penetrate the skin of any animal, of inflicting a wound as poisonous as that inflicted by the full grown fang; for, the gland which secretes the poison is first as active as ever. In the special case referred to, the stuffer took the cobra from the hands of the skinner, who had fed the snake with milk; but, against all rule, incautiously seized the animal with the hand unguarded. It must have been held loosely, for the snake managed to wriggle round a little, and got one of the new fangs, which was still very minute, into a fold of the skin of the forefinger. The stuffer called out for pincers, and some delay took place. At last the assistant took a quill and simply pushed the small tooth out, and the cobra was then restored to its cage. The stuffer at first made light of the bite, but some carbolic acid was put on the puncture, and he was at once sent to the J. J. Hospital. The well-known symptoms of snake-poisoning were already showing themselves, and active measures were at once taken to counteract the effect of the poison. Too high praise cannot be given to the house-surgeon who continued during the whole of the night to keep up artificial respiration; and next morning there was marked improvement, which went on until all signs of snake poison completely disappeared. In speaking of the first night's experience the stuffer afterwards related how he was able to see, hear, and feel perfectly, although quite incapable of speech or movement. Every one began to

feel certain that the staffer was going to make a good recovery: and when it is remembered that every symptom of snake-poisoning had disappeared, it must be admitted that there was good cause for this opinion. Unfortunately, on the third day fever set in, and also inflammation of the lungs, and the staffer slowly sank under these and died on the fifth day, in spite of everything that skilled medical aid and constant and faithful attendance and nursing could do.

As to the temporary recovery from the actual effects of the poison, it will be evident that the amount of poison must have been less than in an ordinary bite. Indeed, remembering that the ducts had been partly excised, it may surprise any one that poison entered the wound at all. But this is accounted for by the fact that, although the duct was partly excised, the gland is still active, and the poison which it secretes can make its way from the duct into the mouth, where it mixes with the saliva, and becomes diluted. In the case of the staffer the small fang was kept in the wound in the fold of skin for some minutes, during which the poisoned saliva could act on the punctured wound. Had the snake been removed at once, my impression is that very little, if any, poison could have entered the wound, and certainly not enough to do any serious injury; but as the snake was kept in this position for some minutes, with the muscles compressing the gland, and forcing the poison into the mouth, it is not difficult to account for the poison which entered the wound, and, through it, the system.

And here an important question arises. One of the daily newspapers in referring to this unfortunate case, expressing its disapproval of poisonous snakes being kept in the V. and A. Museum saying that any one might see any day, in the streets, the same reptiles rendered safe and harmless. The writer either did not know, or did not understand, that the snakes were believed to be harmless: that not only were the same measures adopted which are taken by the snake-charmers to render harmless the cobras exhibited in the public streets, but an additional safeguard was adopted in excising part of the ducts. And the question I refer to is—are the snakes exhibited in the streets perfectly harmless? I do not think they are. Nothing save the complete removal of the glands which secrete the poison can render a poisonous snake harmless. It is true, that the perforate tooth, the hypodermic syringe, as it is termed by Mr. Aitken in the chapter on the *Hypodermatikosyringophoroi* in his "*Tribes on my Frontier*," is not there; but, as the poison is still secreted, and as it must make its way through the duct or fistula into the mouth, a bite with even the ordinary teeth, may be dangerous. I believe that such a bite has resulted in death, and there are cases on record in which death has taken place after such a bite. Since the unfortunate accident occurred at the Museum we have given up altogether the practice of keeping live cobras, and I should advise every one who sets some value on life to give cobras a very wide berth, no matter how positively it may be asserted that any particular specimen has been rendered harmless. You may see from these drawings how difficult a matter it would be to deprive a cobra of its poison glands. They lie deep in the tissue at the side of the head, covered over by the muscles which, by their contraction, compress the glands, and thus squirt the poison in the gland through the duct, and along the perforation of the tooth, into the wound, just at the moment when the animal strikes. Even without the perforated teeth, there is still the poison gland, and although the poison, by mixing with saliva, is less powerful than when undiluted, it is still there, and with all its dreaded power to destroy life.

BOTS OF THE HORSE AND CAMEL.

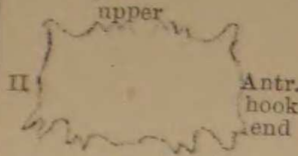
ÆSTRUS CAMELI



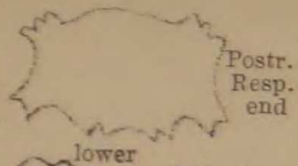
I Hook end

a First segment

b First circle of spines.



II Diagrams of the arrangement of spines in the two species, also in the Camel showing false feet formed on lower surface especially at hookless end.



III Comparison of central segments (under surface).



IV Hookless end showing orifice & its labia

a. Seen directly

b. Seen from upper side

x. Last segment

y. Last row of hooks



upper surface



b

x

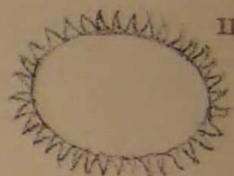
y

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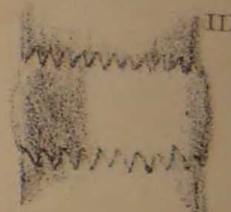


I

a

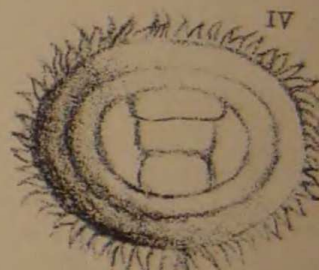


II



III

a



IV

upper surface

b



y



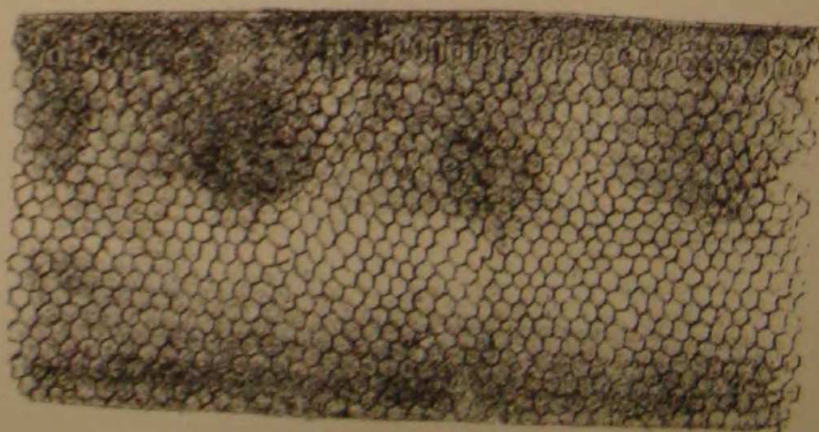
V General

appearance of the larvæ (lower surface) approximately natural size.



V

* These segments are a little too wide in the drawing, they should be closer.

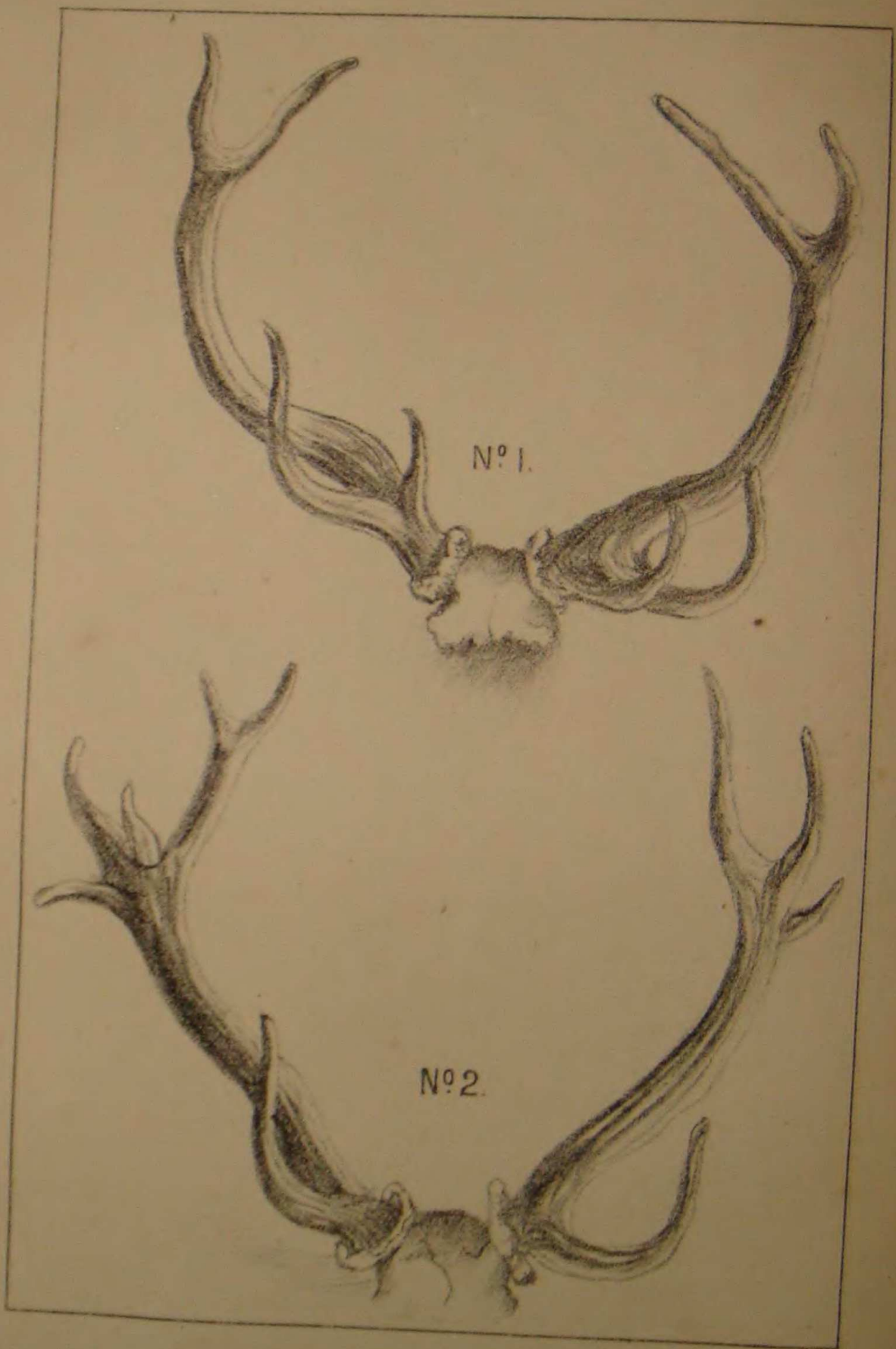


HYDROPHIS PHIPSONII. (*Murray*)



DOE ANTELOPE WITH ABNORMAL HORNS.

t
ta.
acci



ABNORMAL SAMBAR HORNS.